Records of the Western Australian Museum 18: 233–261 (1997).

Australian water mites of the genus *Arrenurus*, with the description of twelve new species from northern and western Australia (Acari: Hydrachnellae: Arrenuridae)

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Abstract – Two new subgenera of the genus *Arrenurus*, viz., *Dividuracarus* (type species *Arrenurus (Dividuracarus) tripartitus* sp. nov.) and *Brevicaudaturus* (type species *Arrenurus lohmanni* Piersig, 1898), and 12 new species, viz., *A. (A.) ensifer*, *A. (A.) harveyi*, *A. (A.) liliaceus*, *A. (A.) mantonensis*, *A. (Dividuracarus) gereckei*, *A. (Dividuracarus) tripartitus*, *A. (Megaluracarus) caeruleus*, *A. (Megaluracarus) gilvus*, *A. (Micruracarus) anbangbang*, *A. (Micruracarus) jabiruensis*, *A. (Micruracarus) purpureus* and *A. (Micruracarus) separatus* are described from Northern Territory and Western Australia. Further, a description is provided for the females of *A. (Brevicaudaturus) lohmanni* Piersig, *A. (A.) balladoniensis* Halík and *A. (Megaluracarus) vanderpalae* Smit, while a more detailed description is given for *A. (Megaluracarus) thienemanni* K.O. Viets. In addition, three species are reported new for the fauna of Australia. A key is given for the Australian species of the genus *Arrenurus*.

INTRODUCTION

Two genera of the water mite family Arrenuridae have been reported from Australia, *Wuria* and *Arrenurus*. Although the genus *Arrenurus* has a cosmopolitan distribution and is one of the most species-rich in the water mites, not more than 20 species and subspecies have been reported from Australia (see Table 1). These species belong to the subgenera *Arrenurus*, *Megaluracarus*, *Micruracarus* and *Truncaturus*. Only one species of *Wuria*, *W. boutit*, is known (Harvey 1989).

On a trip through the Northern Territory and Western Australia, areas seldom visited by acarologists, I collected 15 *Arrenurus* species new for the fauna of Australia, of which 12 species are new to science. Further, two new subgenera of this genus are described. A number of females of previously known species are described for the first time, and three species new to the Australian fauna are reported, i.e. *Arrenurus gracilipes* Piersig, *A. lohmanni* Piersig and *A. rouxi* Walter.

Separate keys are given for the males and females of the Australian members of the genus *Arrenurus*.

All material has been collected by the author. Western Australia and Northern Territory holotypes and paratypes have been deposited in the Western Australian Museum (Perth) (WAM), and in Northern Territory Museum (Darwin) (NTM) respectively. Further, paratypes and almost all non-type material have been deposited in the Zoological Museum of the University of Amsterdam (ZMA).

The following abbreviations have been used (see Figure 9): L1–4 lateroglandularia 1–4; A1–2 pre- and post-antennal glandularia; D1–4 dorsoglandularia 1–4; CX1–4 coxal plates 1–4; PI–PV palp segments 1–5; l.p. ligulate process; SMF – Forschungsinstitut und Naturmuseum Senckenberg. All measurements are in µm, measurements of leg and palp segments are of the dorsal margins. Measurements of paratypes in the description of new species are given in brackets. Unless otherwise stated, all species have the second, third and fourth legs with numerous swimming setae

SYSTEMATICS

Arrenurus (Arrenurus) balladoniensis Halík

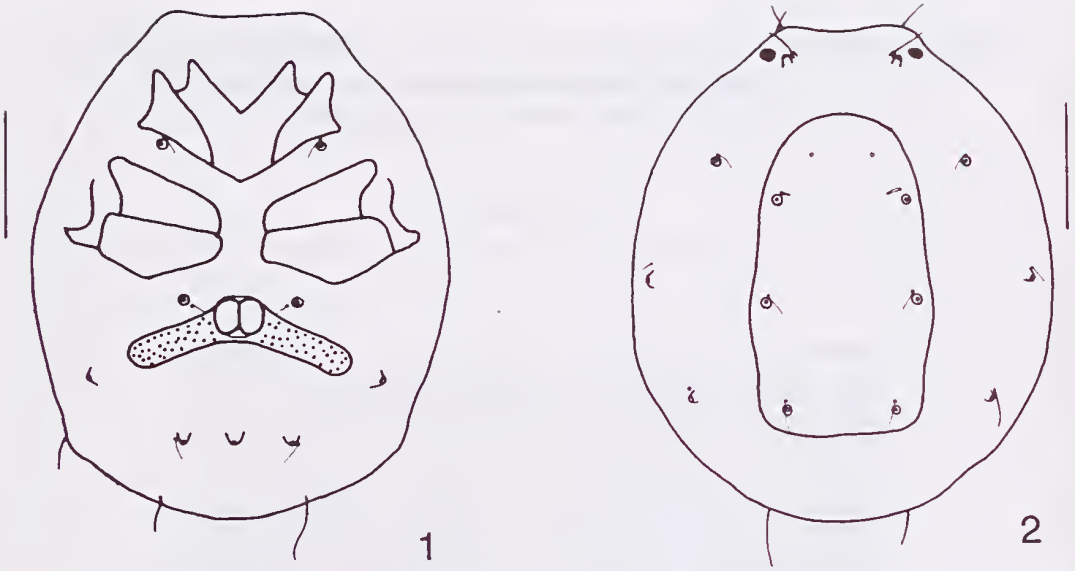
Figures 1–2

Arrenurus balladoniensis Halík, 1940: 283; Halík, 1941: 106; Cook, 1986: 305; Smit, 1992: 106.

Arrenurus quadripapillatus Lundblad, 1941: 120; Lundblad, 1947: 74.

Material Examined

Australia: Northern Territory: 13 ♂, 13 ♀, ponds in Ormiston Creek, Ormiston National Park, 6 August 1994 (ZMA). **Western Australia:** 2 ♂, 2 ♀, Lake Monger, Perth, 26 August 1994 (ZMA).



Figures 1–2 *Arrenurus (Arrenurus) balladoniensis* Halík, ♀: 1, ventral view; 2, dorsal view. Scale lines, 500 µm.

Description

Female

Body 1944 (1848–2232) long and 1656 (1656–1932) wide. Body colour yellow. Anterior body margin slightly concave. Posterolateral corners of body absent. Dorsal shield slender (Figure 2), rounded anteriorly, truncated posteriorly; dorsal shield 1272 long and 708 wide. Capitular bay V-shaped. Distance of CX4 about two times width of one genital valve. Medial margin of CX3 and CX4 of equal length. Gonopore 175 long. Genital valves with small chitinous patches. Genital plates straight and narrow, sloping posteriorly, slightly widened laterally (Figure 1). Lengths of PI–PV: 55, 137, 115, 156, 92; PII with two setae on medial side. Lengths of I-leg-4-6: 243, 223, 223. Lengths of IV-leg-4-6 310, 291, 252.

Remarks

A widespread species in Australia, known from Western Australia, Victoria and Queensland. Only the male of this species was known hitherto, a description of the female is given above.

The shape of the dorsal shield of the female is similar to that of *A. fissipetiolatus* Lundblad and *A. ensifer* sp. nov.

Arrenurus (Arrenurus) ensifer sp. nov.
Figures 3–8

Material Examined

Holotype

♂, pool, Joffre Gorge, Hamersley Range National Park, Western Australia, Australia, 13 August 1994 (WAM).

Paratypes

Australia: Western Australia: 1 ♂ (not fully sclerotized) (ZMA), 1 ♀ (WAM) and 1 nymph (?) (ZMA), Ashburton River at crossing with North West Coastal Highway, 18 August 1994.

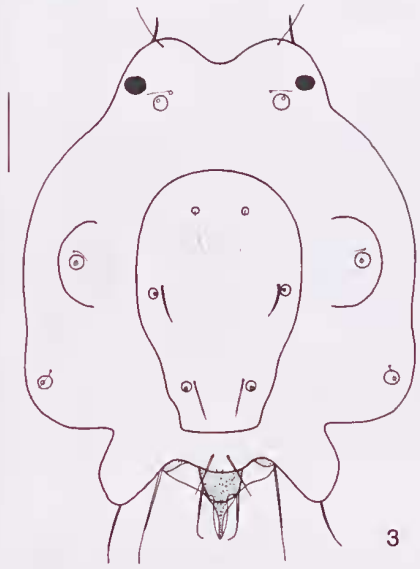
Diagnosis

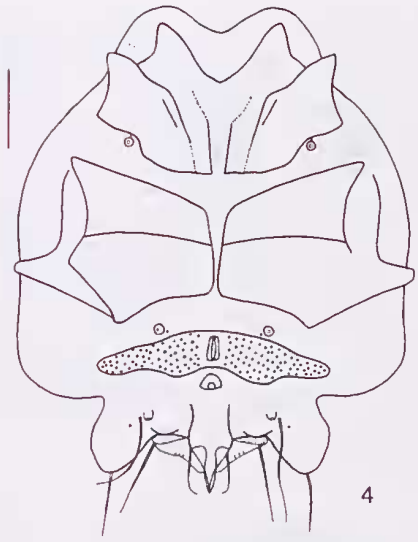
Petiole sword-like, dorsal shield of male truncated. Dorsal shield of female slender, D1 and L4 on humps.

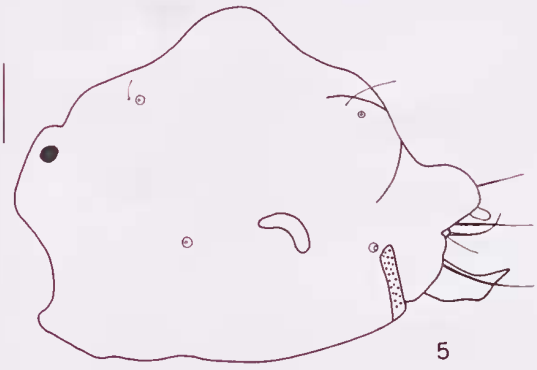
Description

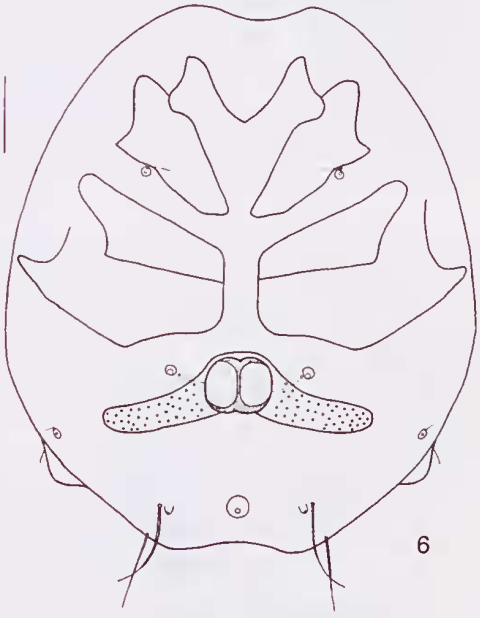
Male

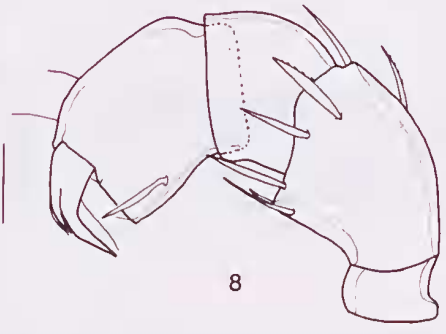
Body 1280 long (including petiole) and 1038 wide. Body colour yellowish. Anterior body margin concave. Dorsal shield 713 long and 446 wide, tapering posteriorly, truncated (Figure 3). D1 on large humps (Figure 5). Cauda short, almost absent. Pygal lobes well developed, broad and rounded. Hyaline membrane large. Gonopore 68 long. Genital plates not extending to lateral body margin, widened medially (Figure 4). Petiole sword-like, 232 long (measured from ventral view). Ligulate process absent. Curved setae extending to posterior margin of petiole. Lengths of PI–PV: 43, 130, 108, 130, 86; PII with 2 heavy setae on medial side near anterior margin of segment; PIV with an angular anteroventral corner. Paratype male with 4 setae on medial side of PII, of which 2 near anteroventral corner of segment. Lengths of I-leg-

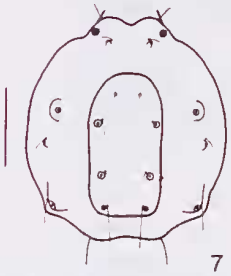




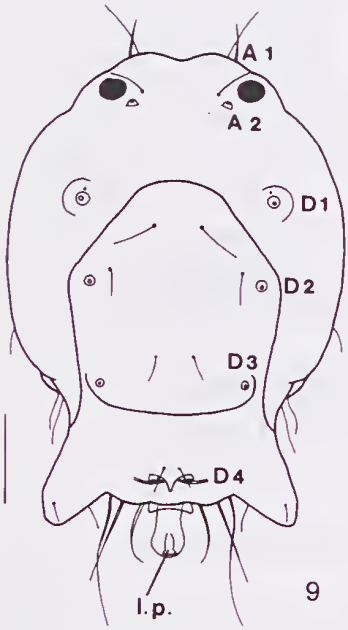








Figures 3–8 *Arrenurus (Arrenurus) ensifer* sp. nov., holotype ♂ (unless stated otherwise): 3, ventral view; 4, dorsal view; 5, lateral view; paratype ♀; 6, ventral view; 7, dorsal view; 8, palp. Scale lines, 50 µm (Figure 8), 200 µm (Figures 3–6), 500 µm (Figure 7).



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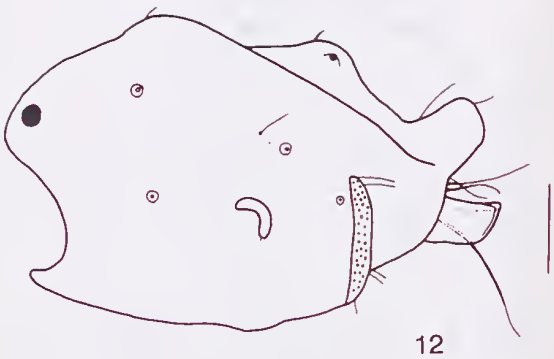

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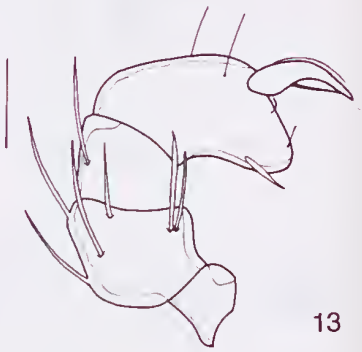

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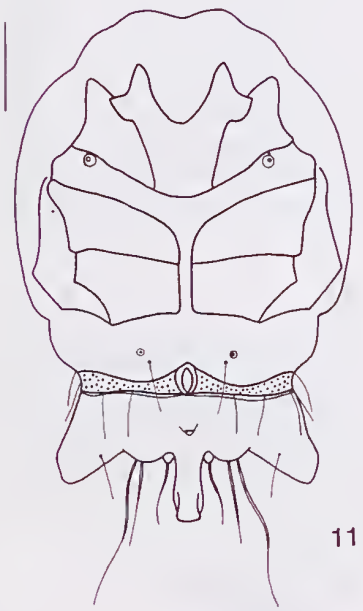

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Figures 9–14 *Arrenurus (Arrenurus) harveyi* sp. nov., holotype ♂ (unless stated otherwise): 9, dorsal view (for explanation of abbreviations see Introduction); 10, detail of petiole; 11, ventral view; 12, lateral view; 13, palp; 14, ventral view, paratype ♀. Scale lines, 50 µm (Figure 10, 13), 200 µm (Figures 9, 11, 12, 14).

4–6: 223, 204, 213. Lengths of IV-leg-4-6: 296, 175, 194; IV-leg-4 with a short spur.

Female

Body 1416 long and 1296 wide. Anterior and posterior body margin concave. D1 and L4 on humps. Dorsal shield slender, rounded anteriorly and truncated posteriorly (Figure 7). Medial margin of CX4 longer than medial margin of CX3. Distance of CX4 larger than one genital valve. Gonopore 145 long, genital valves with small chitinous patches. Genital plates narrow and short, slightly bowed (Figure 6). Excretory pore surrounded by a large sclerotization. Lengths of PI–PV: 48, 113, 98, 124, 82; palp as in male, but PII has in anteroventral corner two large and one small seta (Figure 8). Lengths of I-leg-4-6: 213, 204, 204; lengths of IV-leg-4-6: 272, 233, 243.

Remarks

The female of the new species has a similar dorsal shield as *A. balladoniensis*, but is smaller, with distinct humps on the dorsum. Males of the two species differ in the shape of the petiole. The shape of the petiole separates the male from other species.

Etymology

The species is named after the sword-like petiole.

Arrenurus (Arrenurus) harveyi sp. nov.

Figures 9–14

Material Examined

Holotype

♂, Chinderwariner Pool, Millstream-Chichester National Park, Western Australia, Australia, 15 August 1994 (WAM).

Paratypes

Australia: Western Australia: 2 ♂ (ZMA), 1 ♀ (WAM), same data as holotype.

Diagnosis

Petiole of rounded shape, ligulate process reversed mushroom-shaped. Female with distinct posterolateral corners of the body; genital plates straight and narrow, slightly sloping; genital valves with small, rounded chitinous patches, connected by a small strip.

Description

Male

Body 1154 (1096–1135) long (including petiole) and 766 (732–745) wide. Body colour blueish. Anterior margin of body concave. Cauda and pygal lobes well developed (Figure 9). Dorsal shield incomplete, anterior part more or less triangular. D1 on small hump; D3 on large fused, obtuse hump (Figure 12). Gonopore 49 long. Genital plates narrow and long, extending onto lateral sides of body (Figure 11). Hyaline membrane well developed, trapezoid, posterior margin concave. Petiole 146 long (measured from ventral view), extending beyond pygal lobes, rounded posteriorly. Ligulate process reversed mushroom-shaped (Figure 10). Curved setae extending to posterior margin of petiole. Lengths of PI–PV: 36, 77, 60, 96, 58; PII with 4 seta on medial side, of which 2 setae in anteroventral corner (Figure 13). Lengths of I-leg-4-6: 155, 146, 204; lengths of IV-leg-4-6: 286, 107, 146; IV-leg-4 with a spur.

Female

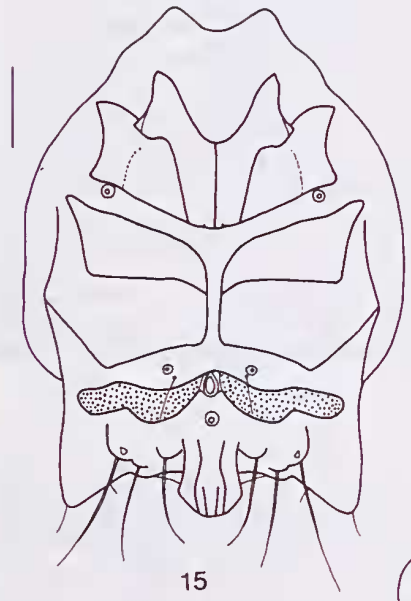
Body 1038 long and 825 wide. Anterior body margin rounded. Posterolateral corners very distinct. L3 on small humps. Gonopore 87 long; genital valves with small, rounded chitinous patches; anterior and posterior patch connected by a small strip. Genital fields straight and narrow, slightly sloping, laterally rounded (Figure 14). Length of PI–PV: 29, 67, 50, 88, 49. PII with 2 setae on medial side, of which one seta located anteroventrally. Length of I-leg-4-6: 87, 68, 145.; length of IV-leg-4-6 175, 145, 136.

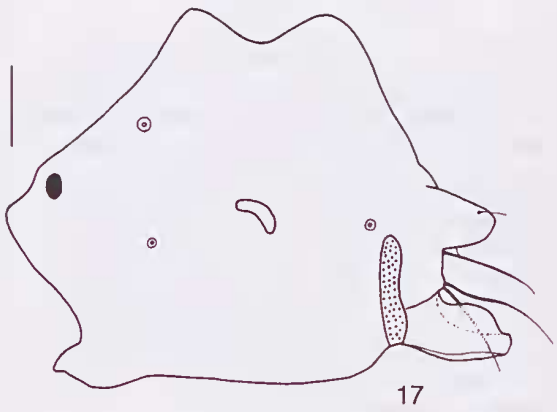
Remarks

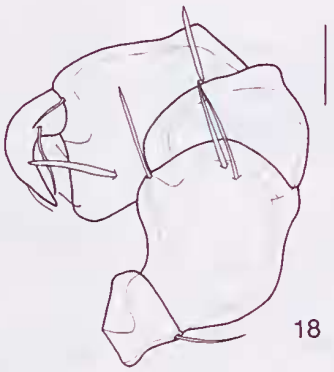
The assignment of the female is somewhat uncertain, as two different *Arrenurus* species

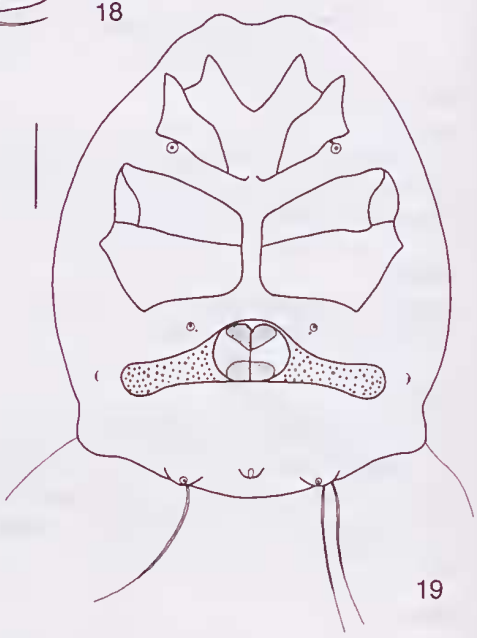
Table 1. Previously reported *Arrenurus* species from Australia (compiled from Cook 1986; K.O. Viets 1975; K.O. Viets 1981; Smit 1992; Smith and Harvey 1989).

Arrenurus (Arrenurus) australicus Lundblad 1941
A. (Arrenurus) balladoniensis Halík 1940
A. (Arrenurus) fissipetiolatus Lundblad 1947
A. (Arrenurus) pseudoaffinis Piersig 1906
A. (Megaluracarus) cheetus Cook 1986
A. (Megaluracarus) harpagopalpus Walter 1929
A. (Megaluracarus) margatellus Cook 1986
A. (Megaluracarus) otodus Cook 1986
A. (Megaluracarus) roobeeki Smit 1992
A. (Megaluracarus) rostratus Daday 1898
A. (Megaluracarus) rostratus degeneratus K.O. Viets 1984
A. (Megaluracarus) thienemanni K.O. Viets 1984
A. (Megaluracarus) tricornutus K. Viets 1955
A. (Megaluracarus) vanderpalae Smit 1992
A. (Megaluracarus) victorianus K.O. Viets 1978
A. (Micruracarus) forpicatoides Lundblad 1941
A. (?Micruracarus) kitchingi Smith and Harvey 1989
A. (Truncaturus) haswelli Cook 1986
A. (Truncaturus) novaehollandiae Lundblad 1947
A. (Truncaturus) tasmanicus Lundblad 1941









Figures 15–19 *Arrenurus (Arrenurus) liliaceus* sp. nov., holotype ♂ (unless stated otherwise): 15, ventral view; 16, dorsal view; 17, lateral view; 18, palp; 19, ventral view, paratype ♀. Scale lines, 50 µm (Figure 18), 200 µm (Figures 15–17, 19).

occurred at the type locality, both represented by one female. I assigned the small female to *A. harveyi*, the large female to *A. liliaceus* sp. nov., because the male of *liliaceus* is larger than *harveyi*. The female of *A. harveyi* is close to *A. liliaceus* and *A. pseudoaffinis* and differs only in the shape of the chitinized patches of the genital valve. The shape of the ligulate process separates the male from other species.

Etymology

The species is named after Dr M.S. Harvey.

Arrenurus (Arrenurus) liliaceus sp. nov.

Figures 15–19

Material Examined

Holotype

♂, Chinderwariner Pool, Millstream-Chichester National Park, Western Australia, Australia, 15 August 1994 (WAM).

Paratype

Australia: Western Australia: 1 ♀, same data as holotype (WAM).

Diagnosis

Male with a broad, posteriorly rounded petiole; ligulate process absent; hyaline membrane large but thin, indented laterally and posteriorly. Females with distinct posterolateral corners of the body, genital valves with chitinous patches, anterior patch triangular, posterior rounded; genital plates straight and narrow, laterally widened.

Description

Male

Body 1242 long and 883 wide. Body colour blueish-green. Anterior margin of body concave. Cauda and pygal lobes well developed. Dorsal furrow incomplete (Figure 16). D1 and D4 on humps (Figure 17). Gonopore 65 long. Genital plates long, wing-shaped, not extending to lateral body margin (Figure 15). Hyaline membrane present, but very thin and difficult to observe, laterally and posteriorly indented. Petiole large, widened in the middle, posterior margin convex. Petiole 184 long (measured from ventral view) and 155 wide. Ligulate process absent. Lengths of PI–V: 41, 91, 89, 118, 73. PIV with a hump; PII with one seta near anteroventral corner and two setae located near the middle of anterior margin (Figure 18). Lengths of I-leg-4-6: 214, 180, 221; lengths of IV-leg-4-6: 291, 194, 184. IV-leg-4 with a long spur.

Female

Body 1140 long and 951 wide. Anterior margin of body concave. Posterolateral corners very distinct. Gonopore 145 long; genital valves with large chitinous patches, the anterior patch triangular, the posterior patch rounded. Genital plates long, straight and narrow, not extending to lateral body margin, laterally widened (Figure 19). V2 on humps. Lengths of PI–PV: 29, 77, 62, 96, 60. PII with 2 anteroventral and 1 more dorsally located seta on medial side of PII; hump of PIV absent. Lengths of I-leg-4-6: 170, 155, 165; lengths of IV-leg-4-6 223, 175, 165.

Remarks

The male is close to *A. shoesmithi* Wiles from Malaysia (Wiles 1993). This last species has a petiole gradually tapering posteriorly, a trapezoid hyaline membrane with a posterior margin which is only slightly concave, and a dorsal shield not narrowed in the middle. Females of the two species differ in the shape of the genital plates. The male of *A. latipetiolatus* Piersig from the Bismarck-Archipel (Piersig 1903) also has a wide petiole, but this petiole is narrowed anteriorly. For similar species of the female see discussion at *A. harveyi* sp. nov.

Etymology

The species name is derived from the fact that the type locality the Chinderwariner Pool, has an abundant growth of water lilies.

Arrenurus (Arrenurus) mantonensis sp. nov.

Figures 20–24

Material Examined

Holotype

♂, Manton Dam, Northern Territory, Australia, 1 August 1994 (NTM).

Paratypes

Australia: Northern Territory: 1 ♂ (not fully sclerotized) (ZMA), 2 ♀ (one not fully sclerotized) (ZMA, NTM), 2 nymphs (ZMA), same data as holotype.

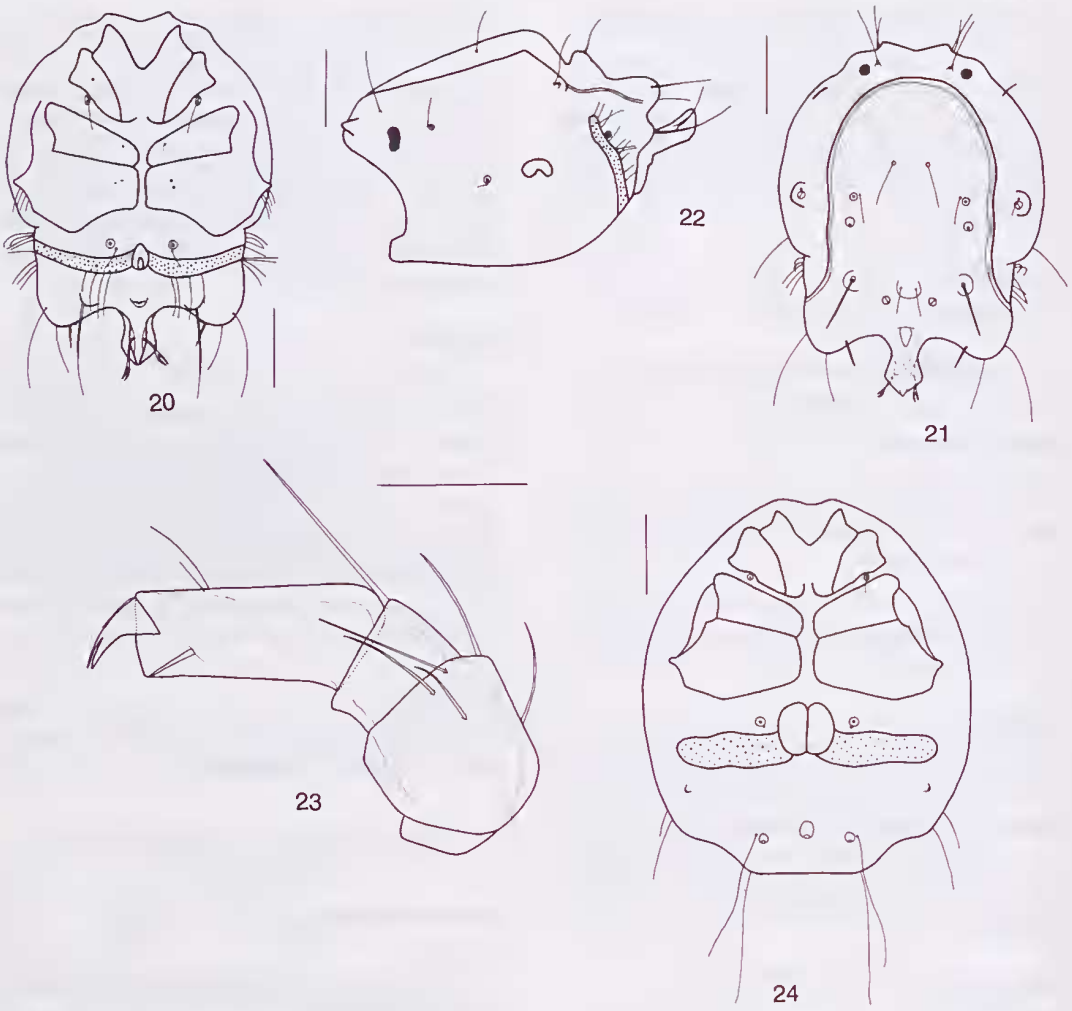
Diagnosis

The very slender PIV is diagnostic for the new species. Petiole with bifurcated setae; hyaline membrane absent.

Description

Male

Body 917 long (including petiole) and 689 wide. Body colour yellowish. Anterior body margin V-shaped. Cauda well developed, pygal lobes short and broad. Dorsal furrow extending onto cauda (Figure 21). D1 on humps, lateral of D4 a seta on

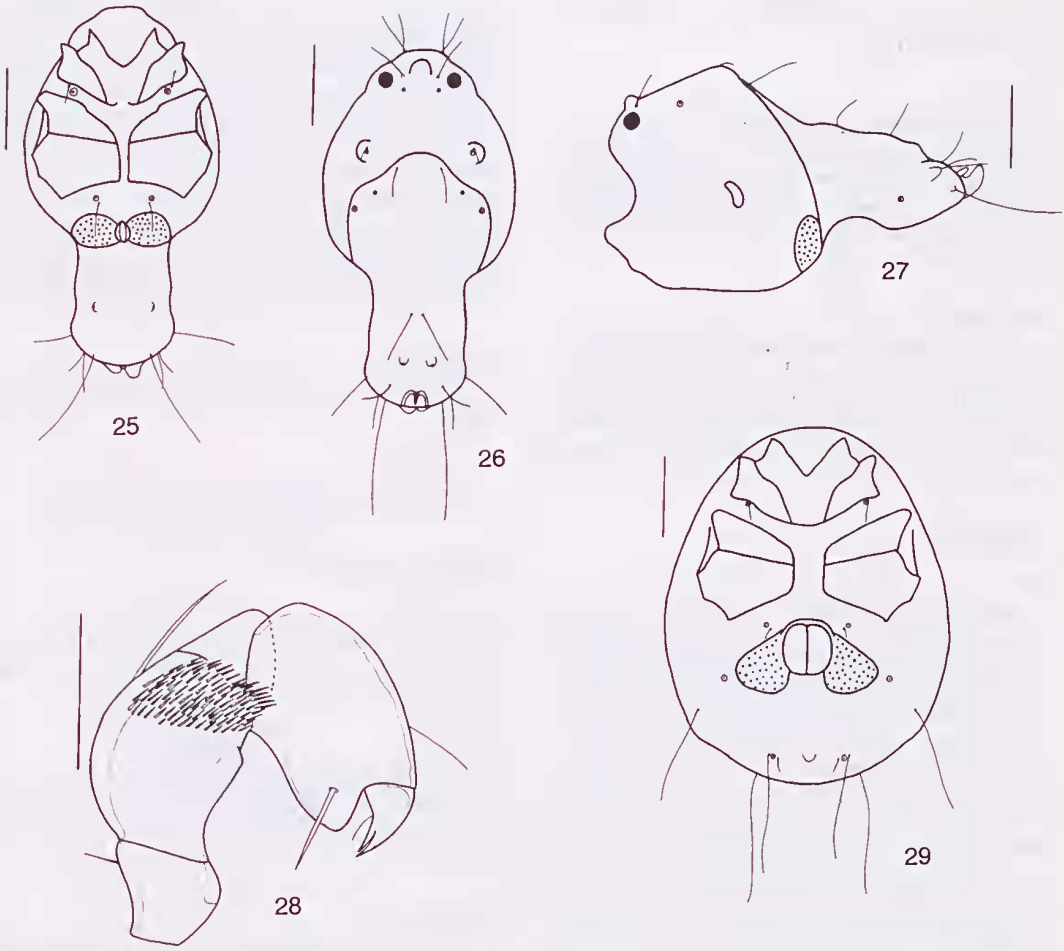


Figures 20–24 *Arrenurus (Arrenurus) mantonensis* sp. nov., holotype ♂ (unless stated otherwise): 20, ventral view; 21, dorsal view; 22, lateral view; 23, palp; 24, ventral view, paratype ♀. Scale lines, 50 µm (Figure 23), 200 µm (Figures 20–22, 24).

humps (Figure 22). Gonopore 68 long. Genital plates long and narrow, extending onto lateral side of body (Figure 20). Posterior margin of genital plates with numerous long setae. Petiole 155 long (measured from ventral view) and 102 wide, with a rhomboid hyaline area. Petiole ventrally with two bifurcated setae, medial part of petiole with a finely serrated lateral margin. Hyaline membrane absent. Cauda dorsally with a tubercle, just anterior of petiole. Lengths of PI–PV: 29, 54, 31, 82, 29; PII with 3 setae on medial side, PIV very slender, with a very short anterior margin (Figure 23). Lengths of I-leg-4-6: 146, 136, 194. Lengths of IV-leg-4-6: 204, 165, 112; IV-leg-4 without a spur.

Female

Body 941 long and 844 wide. Anterior body margin slightly concave. Posterolateral corners of body distinct, posterior body part truncated, posterior body margin straight. Dorsal furrow complete, dorsal shield 815 long. D1 on very small humps. Medial margin of CX4 larger than medial margin of CX3. Medial distance of CX4 less than width of one genital valve. Gonopore 107 long, genital valves without chitinous patches. Genital plates long and straight, anterior margin slightly undulating (Figure 24). Lengths of PI–PV: 25, 52, 34, 78, 25; palp as in male. Lengths of I-leg-4-6: 160, 165, 175. Lengths of IV-leg-4-6: 228, 194, 175.



Figures 25–29 *Arrenurus (Megaluracarus) caeruleus* sp. nov., holotype ♂ (unless stated otherwise): 25, ventral view; 26, dorsal view; 27, lateral view; 28, palp; 29, ventral view, paratype ♀. Scale lines, 50 µm (Figure 28), 200 µm (Figures 25–27, 29).

Remarks

The very slender PIV, with the very short anterior margin, is unusual in *Arrenurus*, and easily separates the new species from other members of the genus.

Etymology

Named after the type locality.

Arrenurus (Arrenurus) rouxi Walter

Arrhenurus pseudoaffinis (in part, ♀) Piersig, 1906: 360.

Arrhenurus rouxi Walter, 1915: 120; Walter, 1928: 259.

Arrenurus rouxi Walter: K. Viets, 1935: 9; Cook, 1967: 228; Lundblad, 1969: 417; Wiles, 1990: 281.

Material Examined

Australia: Western Australia: 1 ♂, Deep Reach Pool, Millstream-Chichester National Park, 15 August 1994 (ZMA).

Remarks

A widespread species, known from New Caledonia, Sumatra, Java, Burma, India, Burma, Singapore, Sri Lanka and Sulawesi. The new record is the first for Australia.

Arrenurus (Megaluracarus) caeruleus sp. nov.

Figures 25–29

Material Examined

Holotype

♂, Pools upstream of Waterfall Creek, Kakadu

National Park, Northern Territory, Australia, 25 July 1994 (NTM).

Paratypes

Australia: Northern Territory: 2 ♂, 6 ♀, same data as holotype (NTM); 2 ♂, Lily Ponds Falls, Katherine Gorge National Park, 27 July 1994 (ZMA); 1 ♂ (WAM), 4 ♀ (WAM, ZMA), Plunge Pool, Edith Falls, Katherine Gorge National Park, 30 July 1994.

Diagnosis

PII with patch of setae; body dorsally with short projection (rostrum). Cauda of male rounded and slightly enlarged posteriorly; posterior margin of cauda with a small, irregular shaped hyaline area. Female with short and broad genital plates, sloping posteriorly.

Description

Male

Body 902 (854–1028) long and 475 (466–524) wide. Body colour blue. Anterior body margin straight. Anterior end of body dorsally with a short projection (rostrum). Dorsal shield incomplete, dorsal furrow extending onto lateral sides of body. D1 on small humps (Figure 27). Cauda well developed, 330 long, posterior part slightly enlarged, posterior margin rounded (Figure 26). Posterior margin of cauda with a small, irregular shaped hyaline area. Gonopore 58 long. Genital plates short, anterior and posterior margins rounded, extending to lateral body margin (Figure 25). Petiole present, dagger-like; one of the paratypes has a double petiole. Lengths of PI–PV: 29, 62, 35, 69, 26; PII with a patch of setae (Figure 28). Lengths of I-leg-4-6: 114, 126, 116. Lengths of IV-leg-4-6: 155, 136, 165; IV-leg-4 with a short, truncated spur.

Female

Body 863 (728–883) long and 698 (611–737) wide. Body slender to broad egg-shaped, posterolateral corners absent or present. Anterior body margin rounded, rostrum short. D1 not on humps. Dorsal shield complete, 427–504 long. Medial margin of CX4 larger than medial margin of CX3. Medial distance of CX4 about as large as width of one genital valve. Gonopore 126 long; genital valves without chitinous patches. Genital plates short and broad, sloping posteriorly (Figure 29). Lengths of PI–PV: 29, 73, 36, 52, 34; palp as in male. Lengths of I-leg-4-6: 116, 126, 97. Lengths of IV-leg-4-6: 165, 175, 165.

Remarks

A small number of species of the subgenus *Megaluracarus* have been described from Australia. Most closely related are *A. margatellus* Cook, which differs from the new species in medial projection at the posterior margin of the cauda, and *A. cheetus* Cook, which has a different petiole. The female is very close to *A. thienemanni* K.O. Viets. The dorsal shield of *caeruleus* is smaller, the ratio of body length/length of dorsal shield is 1.58–1.70 for *caeruleus* and 1.39–1.48 for *thienemanni*. Further, *A. caeruleus* does not have the large anterior seta on the dorsal margin of PIV. Like *thienemanni*, females of *caeruleus* are variable in body shape.

Etymology

The species is named for its conspicuous blue colour.

Arrenurus (Megaluracarus) gilvus sp. nov.

Figures 30–34

Material Examined

Holotype

♂, Lily Ponds Falls, Katherine Gorge National Park, Northern Territory, Australia, 27 July 1994 (NTM).

Paratypes

Australia: Northern Territory: 1 ♀, same data as holotype (NTM); 1 ♂, Southern Rockhole, Katherine Gorge National Park, 27 July 1994 (ZMA).

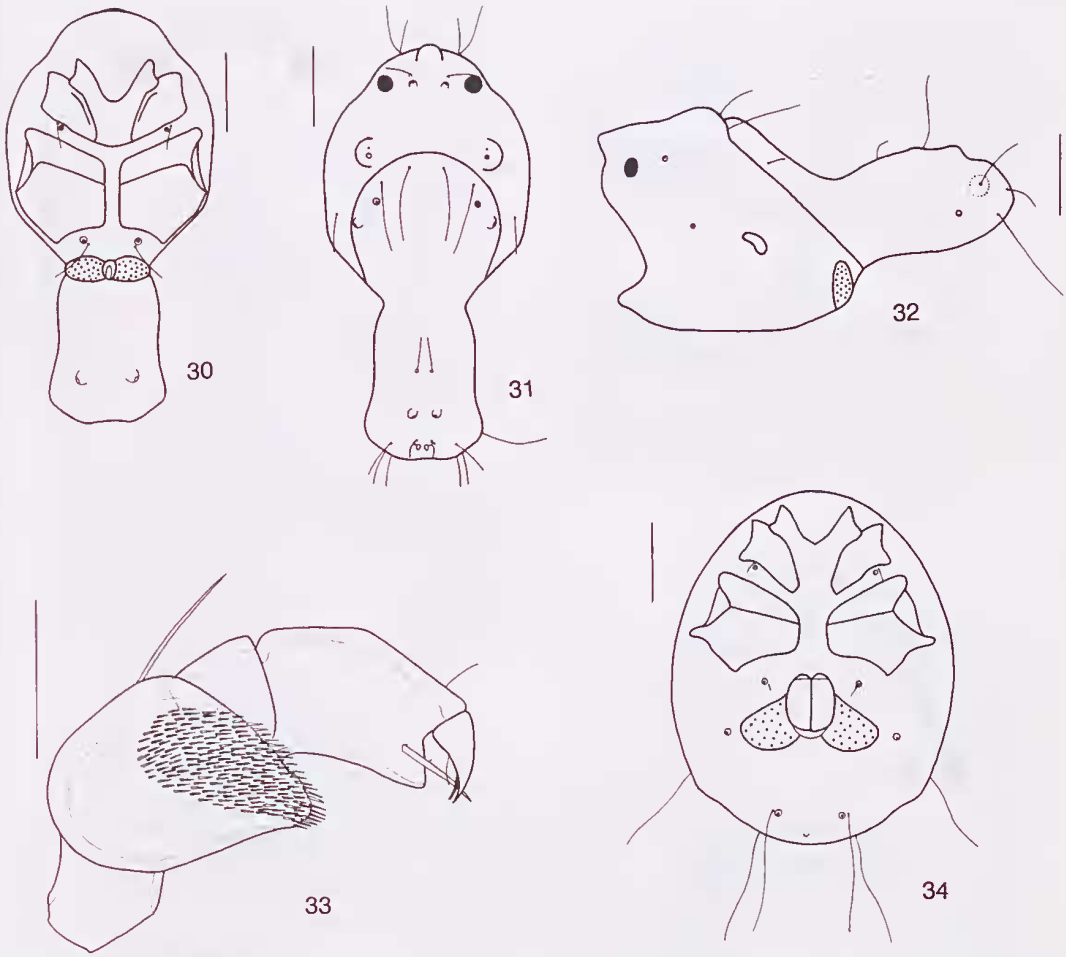
Diagnosis

Body colour yellowish, body dorsally with small rostrum. PII with large patch of setae. Cauda of male posteriorly widened, with straight to slightly concave posterior margin; posterodorsally on cauda two peg-like setae; posterior margin of cauda with small hyaline area. Female with short, broad, posteriorly sloping genital plates.

Description

Male

Body 1048 (1004) long and 524 (495) wide. Body colour yellowish. Anterior body margin rounded, near anterior margin a small rostrum. D1 on small humps (Figure 32). Postocularia and associated setae of D2 very long. Cauda well developed, longer than wide, posteriorly widened, posterior margin of cauda straight to slightly concave (Figure 31). Dorsally on cauda, near posterior margin two rounded peg-like setae; posterior margin of cauda with a very small hyaline area. Genital plates short and broad, extending to lateral body margin (Figure 30). Lengths of PI–PV: 29, 65, 35, 68, 23; PII with large patch of setae on a bulge (Figure 33).



Figures 30–34 *Arrenurus (Megaluracarus) gilvus* sp. nov., holotype ♂ (unless stated otherwise): 30, ventral view; 31, dorsal view; 32, lateral view; 33, palp; 34, ventral view, paratype ♀. Scale lines, 50 µm (Figure 33), 200 µm (Figures 30–32, 34).

Lengths of I-leg-4-6: 126, 136, 141. Lengths of IV-leg-4-6: 189, 131, 165; IV-leg-4 with a short, truncated spur.

Female

Body 878 long and 708 wide. Body colour brownish yellow. Anterior body margin rounded. Posterolateral corners of body indistinct. Medial margin of CX4 larger than medial margin of CX3. Medial distance of CX4 larger than width of one genital valve. Genital valves without chitinous patches. Genital plates short and rounded, sloping posteriorly (Figure 34). Lengths of PI–PV: 31, 67, 41, 67, 29; palp as in male. Lengths of I-leg-4-6: 116, 145, 136. Lengths of IV-leg-4-6: 160, 165, 170.

Remarks

A number of females have genital plates similar to those of *A. gilvus*, e.g. *A. vanderpalae*, *A. caeruleus* sp. nov. and *A. thienemanni*. The last two species differ in having a blue body colour, while the female of *A. vanderpalae* is larger and has more angular genital plates.

Etymology

Named for the light-yellow colour of the male.

Arrenurus (Megaluracarus) thienemanni K.O. Viets

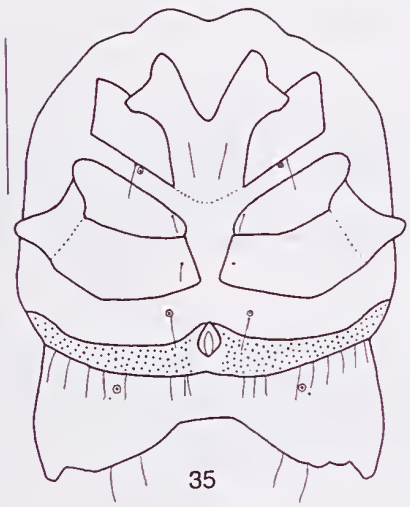
Figures 41–44; 74

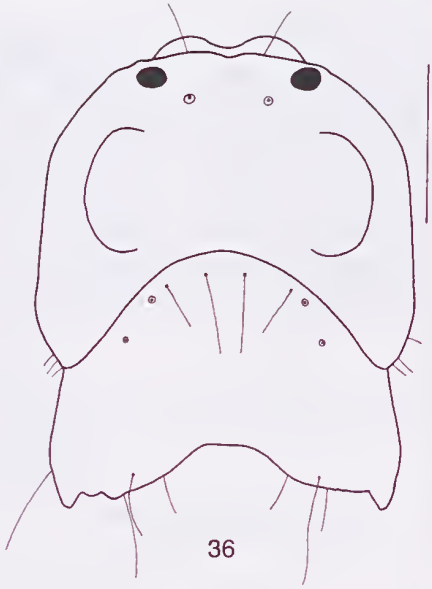
Arrenurus thienemanni K.O. Viets, 1984: 432.

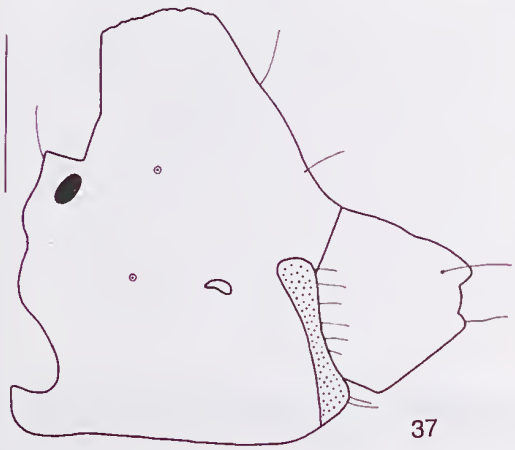
Material Examined

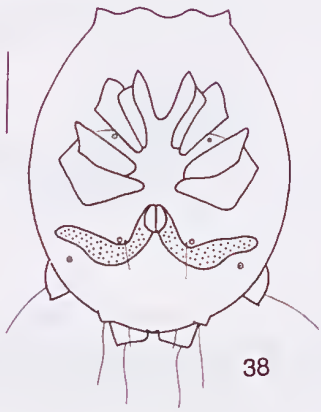
Holotype

♂, Roper Valley, Station spring, Northern









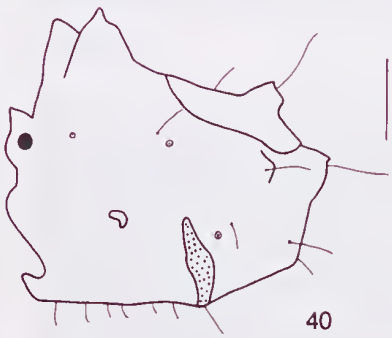
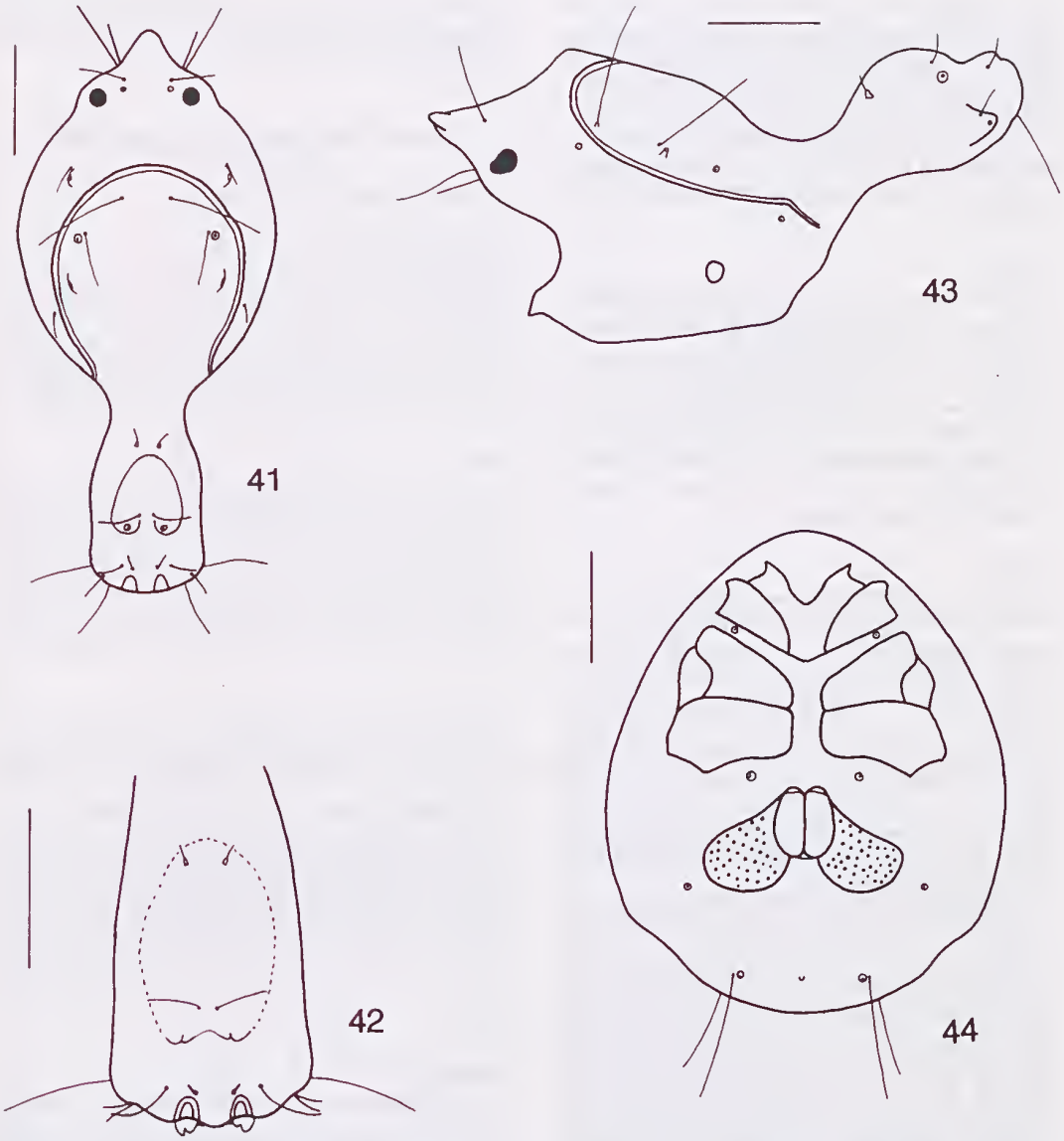


Figure 35–40 *Arrenurus (Brevicaudaturus) lohmanni* Piersig: 35–37, ♂: 35, ventral view; 36, dorsal view; 37, lateral view; 38–40, ♀: 38, ventral view; 39, dorsal view; 40, lateral view. Scale lines, 500 µm.



Figures 41–44 *Arrenurus (Megaluracarus) thienemanni* K.O. Viets: 41–43, ♂: 41, ventral view; 42, dorsal view cauda; 43, lateral view; 44, ventral view, ♀. Scale lines, 200 µm.

Territory, Australia, 12 July 1981, B.V. Timms (SMF, slide 7443).

Paratypes

Australia: Northern Territory: 3 ♀, same data as holotype (SMF, slides 7448, 7449, 7450).

Other Material

Australia: Northern Territory: 2 ♂, 3 ♀, Lake Jabiru, Jabiru, 20 July 1994; 2 ♂, 4 ♀, Southern Rockhole, Katherine Gorge National Park, 27 July 1994; 16 ♂, 13 ♀, Pools upstream of Waterfall Creek, Kakadu National Park, 25 July 1994; 1 ♀, Pool near Jim Jim Falls, Kakadu National Park, 23 July 1994; 4 ♂, Lily Ponds Falls, Katherine Gorge National Park, 27 July 1994 (all ZMA).

Description

Male

The cauda of the male has two indentations in lateral view, one large and one small, with a large, obtuse hump. Viets illustrated the cauda without these indentations, although they can be observed

in the holotype. Body 926–1193 long and 369–524 width. Genital plates short and broad, extending almost to lateral body margin. Posterior margin of cauda in specimens from Waterfall Creek and Lake Jabiru have a hyaline area (see Figure 42), which is also present in the holotype. The cauda of males from Waterfall Creek and Lake Jabiru is in lateral view less upturned than in specimens from other localities.

Female

Body 878 (708–844) long and 737 (533–655) wide. The genital plate is large, short and rounded, sloping posterolaterally. The body shape is broad egg-shaped to slender egg-shaped. Body with indistinct to very distinct posterolateral corners. Dorsal shield 470–592. Medial margin of CX4 larger than medial margin of CX3. Medial distance of CX4 less than width of one genital valve. Gonopore 116 long. Palp as in male.

Remarks

K.O. Viets (1984) described this species from Northern Territory, but examination of the holotype revealed that his description is inaccurate in some aspects for the male. The females found in this study are quite different from the one described by Viets. Examination of the paratype females showed, that the female illustrated by Viets (slide 7448) has slightly larger genital plates, while the female of slide 7449 has much larger genital plates, and is similar to the females of this study.

Below I will give some additional characters for the male and for the female.

A. thienemanni is a highly variable species. The variation in size is large, in males as well as in females. Further, the shape of the cauda of the males and the body shape of the females is variable. As all specimens of this study have the large anterior seta on the dorsal margin of PIV, an unusual character in the genus *Arrenurus*, I assigned all to *A. thienemanni*. The related *A. rostratus* is known to be highly variable as well, especially in the shape of the cauda (Walter 1929).

Arrenurus (Megaluracarus) rostratus degeneratus K.O. Viets

Arrenurus rostratus degeneratus K.O. Viets, 1984: 434.

Material Examined

Australia: Northern Territory: 5 ♂, Lake Jabiru, Jabiru, 20 July 1994 (ZMA).

Remarks

This subspecies is only known from the Northern Territory. The body length of the males from this study varies between 1004 and 1038, the body width varies between 417 and 427. The holotype a is larger, the body length is 1214 and the body width 482 (K.O. Viets 1984).

Arrenurus (Megaluracarus) vanderpalae Smit
Figures 45–46

Arrenurus vanderpalae Smit, 1992: 109.

Material Examined

Australia: Western Australia: 2 ♂, 1 ♀, Kalamina Gorge, pond near falls, Hamersley Range National Park, 13 August 1994 (ZMA); 15 ♂, 8 ♀, Jones River, E. of Roeburne, 17 August 1994 (WAM, ZMA); 5 ♀, Pond Snake Creek, Millstream-Chichester National Park, 17 August 1994 (ZMA).

Male

Body 1135–1320 long, body 466–650 wide. The cauda shows some variation, specimens with a more triangular shaped cauda can be found. The posterior part of the cauda has in fully sclerotized specimens a medial extension, bordered on each side by a hyaline area (Figure 45), which can be seen from a lateral view. IV-leg-4 with a short spur.

Female

Body 1125 (1104–1224) long and 931 (892–931) wide. Body broad egg-shaped, with indistinct posterolateral corners. Medial distance of CX4 about equal length of width of one genital valve. Posterior margin of CX4 directed transversally. Gonopore 155 long. Genital plates short, anterior margin straight and beginning halfway gonopore, posterior margin rounded (Figure 46). Palp as in male, with a patch of setae on PII lying on a bulge. Lengths of PI–PV: 26, 65, 50, 82, 41. Lengths of I-leg-4-6: 150, 146, 126. Lengths of IV-leg-4-6: 213, 213, 179.

Remarks

In addition to the description by Smit (1992), which was based on one male only, some remarks will be made on the male. The female was hitherto unknown and is described above.

Also see the discussion under *A. gilvus* sp. nov.

Arrenurus (Micruracarus) anbangbang sp. nov.
Figures 47–50

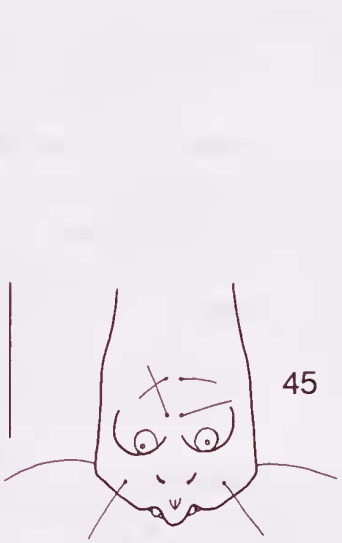
Material Examined

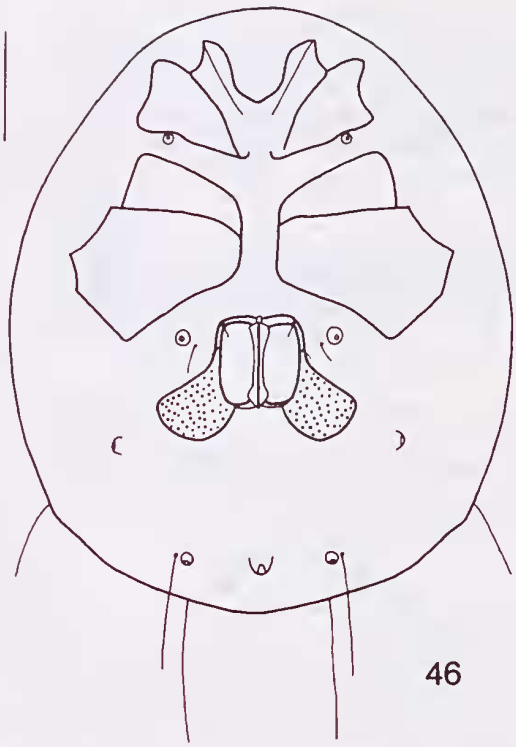
Holotype

♂, Anbangbang Billabong, Kakadu National Park, Northern Territory, Australia, 20 July 1994 (NTM).

Paratypes

Australia: Northern Territory: 2 ♂, 5 ♀, 1





Figures 45–46 *Arrenurus (Megaluracarus) vanderpalae* Smit: 45, dorsal view cauda, ♂; 46, ventral view, ♀. Scale lines, 200 µm.

nymph, same data as holotype (NTM); 1 ♂, Billabong Yellow Waters, Kakadu National Park, 21 July 1994 (ZMA); 1 ♂, 1 ♀, Jim Jim Billabong at crossing with Kakadu Highway, Kakadu National Park, 22 July 1994 (ZMA).

Other Material

Australia: **Western Australia**: 1 ♂, Pond Hancock Gorge, Hamersley Range National Park, 14 August 1994 (WAM); 1 ♂, 9 ♀, Pond Snake Creek, Millstream-Chichester National Park, 17 August 1994 (WAM); 1 ♂, 1 ♀, Jones River, east of Roeburne, 17 August 1994 (ZMA).

Diagnosis

Posterior body margin of male with a cleft, which widens anteriorly; petiole hyaline, tong-shaped; genital plates very narrow, extending onto dorsum. Female with large chitinous patches on genital valves, the anterior patches smaller than the posterior, anterior margin of posterior patch straight; genital plates long, sloping posteriorly and widened laterally.

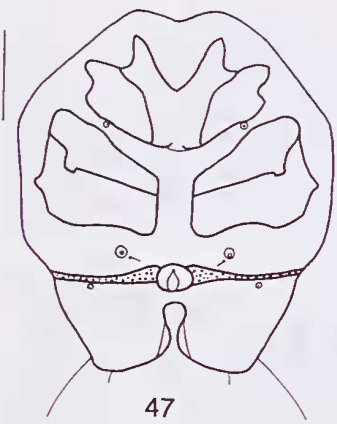
Description

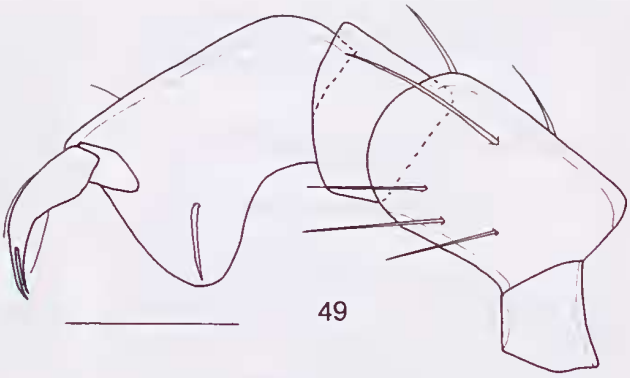
Male

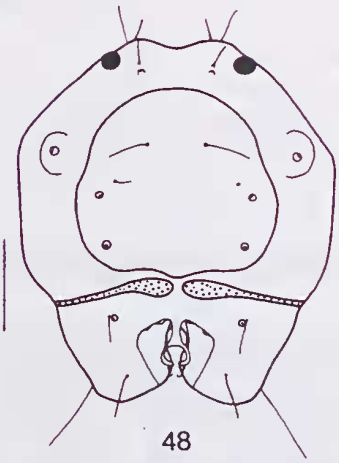
Body 802 (703–786) long and 718 (592–674) wide. Body colour blue. Anterior body margin concave. Cauda present, caudal lobes rounded. Posterior body margin with a cleft, which widens anteriorly. Dorsal furrow complete; dorsal shield 422 (359–388) long, posterior margin undulating. D1 on humps. Gonopore 48 long. Genital plates long and narrow, extending onto dorsum (Figure 47). Petiole present, hyaline, tong-shaped (Figure 48). Lengths of PI–PV: 29, 53, 38, 84, 43. PII rectangular, with four setae on medial side, PIV with a large, rounded anteroventral corner (Figure 49). Lengths of I-leg-4-6: 112, 116, 136. Lengths of IV-leg-4-6: 170, 146, 116; IV-leg-4 without spur.

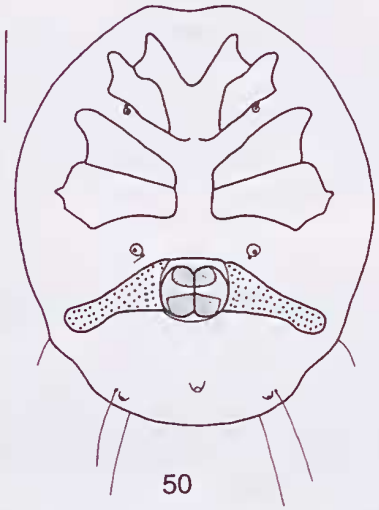
Female

Body 912 (776–941) long and 795 (669–805) wide. Anterior body margin slightly concave. Posterolateral corners of body indistinct. Posterior body margin concave, straight or slightly convex. Dorsal furrow complete, dorsal shield 718 (572–708) long. D1 on small humps. Medial margin of CX4 larger than medial margin of CX3. Medial distance of CX4 as large as or smaller than width of genital valve. Gonopore 87 long. Genital valves with large chitinous patches, the anterior smaller than the posterior. Anterior margin of posterior patches straight. Genital plates long, sloping









Figures 47–50 *Arrenurus (Micruracarus) anbangbang* sp. nov., holotype ♂ (unless stated otherwise): 47, ventral view; 48, dorsal view; 49, palp; 50, ventral view, paratype ♀. Scale lines, 50 µm (Figure 49), 200 µm (Figures 47–48, 50).

posteriorly and laterally widened (Figure 50). However, there is much variation in the shape of the genital plates, many females have more bowed genital plates, which are narrowed laterally. Lengths of PI–PV: 29, 58, 41, 84, 41; PII with three setae on medial side, palp as in male. Lengths of I-leg-4-6: 136, 116, 121. Lengths of IV-leg-4-6: 175, 145, 131.

Remarks

The new species is close to *A. forpicatoides* Lundblad. The male of the new species has a free lying petiole, while the petiole of *A. forpicatoides* is fused with the cauda by a hyaline area. According to Lundblad (1947) *A. forpicatoides* has no petiole, but instead a hyaline area, which he supposed to be homologous with a petiole. However, in my opinion a distinct petiole is present in *forpicatoides*, which is, as stated above, fused with the cauda. Another character that separates the male of the new species from *forpicatoides* is the shape of the caudal lobes (rounded in *anbangbang*, truncated in *forpicatoides*). The female of the new species is close to *A. jabiruensis* sp. nov., *A. madaraszi* Daday and *A. forpicatoides* Lundblad. *A. anbangbang* differs from these three species in the large, pronounced anteroventral corner of PIV. *A. jabiruensis* has less bowed genital plates, but due to the variation in the shape of the genital plates, the differences are small. Further, females of *jabiruensis* have a distinct truncated posterior body part. Females of *A. madaraszi* are very close to the new species, but

differ in broader genital plates and the absence of posterolateral corners of the body. *A. forpicatoides* has shorter genital plates.

Etymology

Named after the type locality.

Arrenurus (Micruracarus) jabiruensis sp. nov.

Figures 51–55

Material Examined

Holotype

♂, Lake Jabiru, Jabiru, Northern Territory, Australia, 20 July 1994 (NTM).

Paratypes

Australia: Northern Territory: 1 ♂, 5 ♀, Lake Jabiru, Jabiru, 20 July 1994 (ZMA); 2 ♀, Pond in Jim Jim Creek, at Jim Jim Crossing, Kakadu National Park, 22 July 1994 (NTM); 1 ♀, 1 nymph, Small Billabong, Yellow Waters, Kakadu National Park, 22 July 1994 (NTM); 1 ♀, Jim Jim Billabong at crossing with Kakadu Highway, Kakadu National Park, 22 July 1994 (NTM); 1 ♀, Manton Dam, 1 August 1994 (WAM).

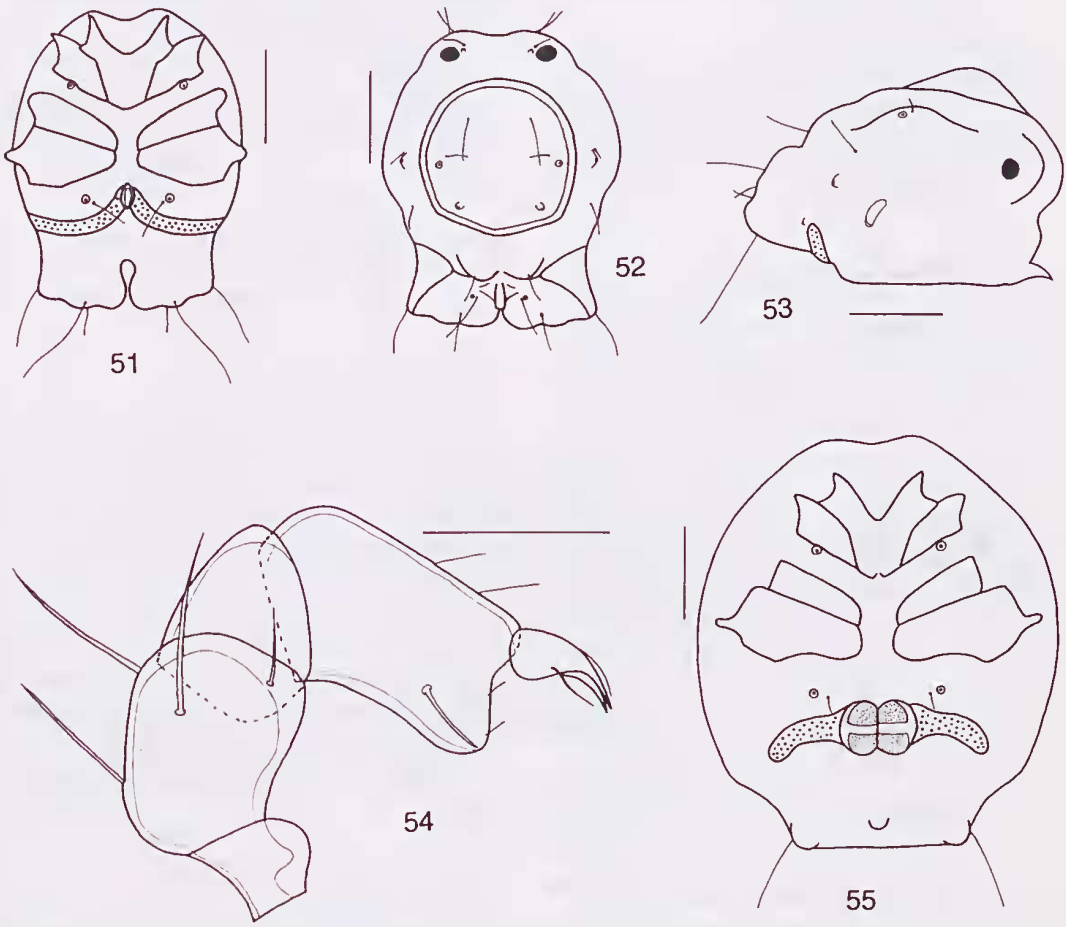
Diagnosis

Cauda of male with a cleft, petiole chisel-shaped; posterior margin of cauda slightly indented. Female with a truncated posterior body part, posterior body margin straight.

Description

Male

Body 650 (698) long and 524 (550) wide. Body colour blue-green. Dorsal furrow complete, dorsal



Figures 51–55 *Arrenurus (Micruracarus) jabiruensis* sp. nov., holotype ♂ (unless stated otherwise): 51, ventral view; 52, dorsal view; 53, lateral view; 54, palp; 55, ventral view, paratype ♀. Scale lines, 50 µm (Figure 54), 200 µm (Figures 51–53, 55).

shield 340 long, without humps, rounded with posterior margin slightly angular. Anterior body margin concave. Cauda well set off from body, with a median cleft. Petiole chisel-shaped, with convex lateral margins and a straight posterior margin (Figure 52). Posterior margin of cauda slightly indented. L3 on obtuse humps; D4 on small humps (Figure 53). Genital plates bowed, narrow, extending onto lateral sides of body (Figure 51). Gonopore 58 long. Lengths of PI–V: 24, 48, 65, 72, 34; PII with two setae on medial side (one large and one small seta) (Figure 54). Lengths of I-leg-4-5: 103, 106, 122; lengths of IV-leg-4-6: 146, 113, 127. IV-leg-4 with a long, pointed spur.

Female

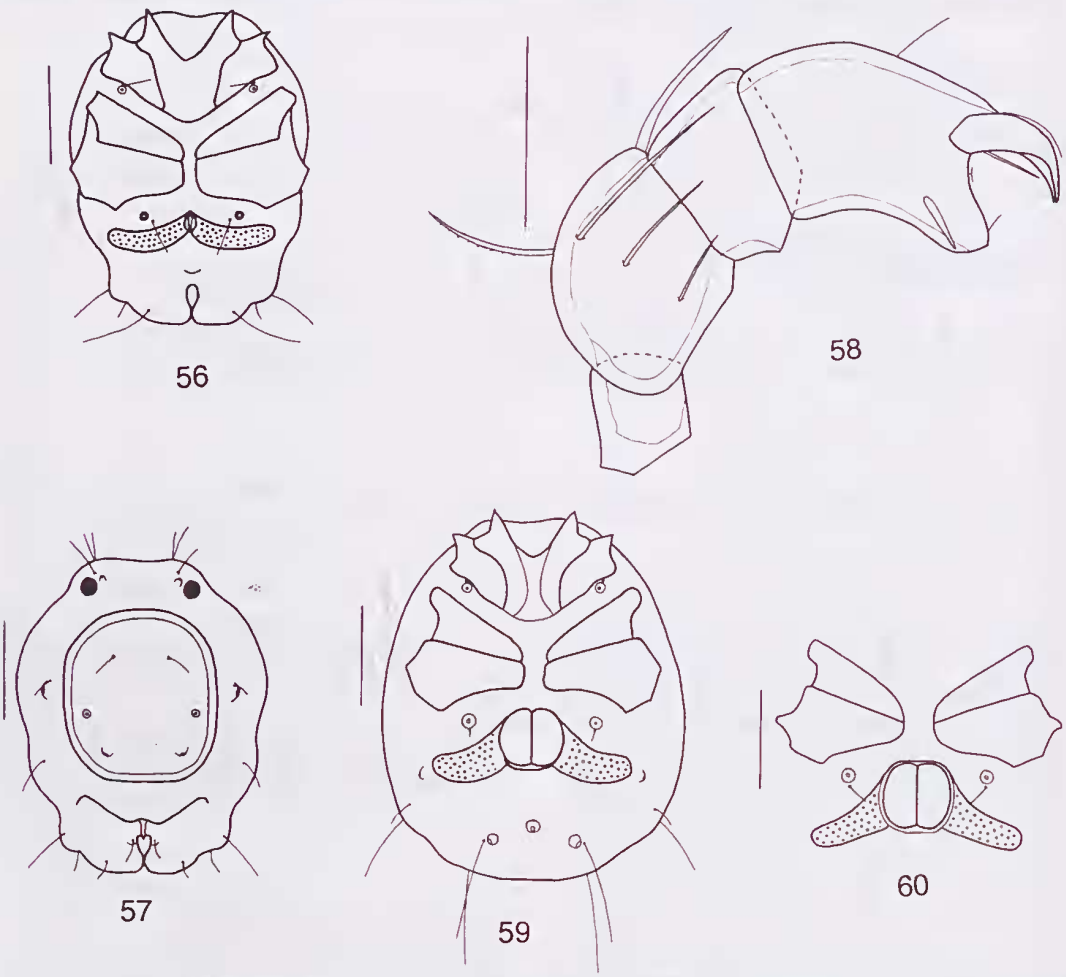
Body 892 (844-931) long and 795 (737–844) wide. Body oval-shaped, truncated posteriorly and with a straight posterior margin (Figure 55). Capitular bay V-shaped. Medial margin of CX4 larger than medial margin of CX3. Distance of CX4 as large as one genital valve. Gonopore 92 long; genital valves with large chitinous patches. Genital plates narrow, geniculated. Lengths of PI–V: 34, 58, 36, 82, 38; PII with 3 setae on medial side. Lengths of I-leg-4-6: 126, 116, 126; lengths of IV-leg-4-6: 155, 145, 136.

Remarks

Females are more difficult to separate from related species, e.g. *A. madaraszi* Daday. The female of the new species has geniculate genital plates, but most characteristic is the truncated posterior body part.

Etymology

The species is named after the type locality.



Figures 56–60 *Arrenurus (Micruracarus) purpureus* sp. nov.: 56–58, holotype ♂: 56, ventral view; 57, dorsal view; 58, palp; a; 59–60, paratype ♀: 59, ventral view; 60, ventral view. Scale lines, 50 µm (Figure 58), 200 µm (Figures 56–57, 59–60).

Arrenurus (Micruracarus) purpureus sp. nov.
Figures 56–60

Material Examined

Holotype

♂, Pond Snake Creek, Millstream-Chichester National Park, Western Australia, Australia, 17 August 1994 (WAM).

Paratypes

Australia: Western Australia: 2 ♂, 13 ♀, same data as holotype (ZMA); 1 ♀, Pond Kalamina Falls, near falls, Hamersley Range National Park, 13 August 1994 (WAM); 2 ♂, 7 ♀, Palm Pool, Millstream-Chichester National Park, 15 August 1994 (WAM); 1 ♀, Chinderwariner Pool, Millstream-Chichester National Park, 15 August 1994 (ZMA); 1 ♂, Crossing Pool, Millstream-Chichester National Park, 16 August 1994 (ZMA); 4 ♀, small pond near Crossing Pool, Millstream-Chichester National Park, 16 August 1994 (NTM); 1 ♀, Python Pool, Millstream-Chichester National Park, 17 August 1994 (ZMA); 2 ♂, Jones River, E. of Roeburne, 17 August 1994 (WAM); 2 ♂, Fortescue River at crossing with Highway, 18 August 1994 (NTM); 1 ♀, Ashburton River, at crossing with North West Coastal Highway, 18 August 1994 (WAM).

Diagnosis

Body colour purple. Male with a closed median cleft and a dagger-like petiole. Females with short and bowed genital plates.

Description

Male

Body 640 (592–660) long and 510 (456–524) wide. Body colour purple. Anterior margin of body slightly concave. Dorsal furrow complete, dorsal shield 359 (310–373) long. D1 on small humps. Cauda short, indistinctly set off from body, with a closed median cleft. Cauda posterolateral indented, forming four lobes (Figure 57). Medial margin of CX4 longer than medial margin of CX3. Just anterior of petiole two fused tubercles. Petiole simple, dagger-like. Gonopore 43 long. Genital plates bowed, not extending to lateral body margin (Figure 56). Lengths of PI–PV: 26, 53, 36, 67, 34; PII with 3 setae on medial side (Figure 58). Lengths of I-leg-4-6: 107, 107, 116. Lengths of IV-leg-4-6: 146, 102, 126; IV-leg-4 with a spur.

Female

Body 737 (689–873) long and 621 (592–723) wide. Anterior body margin slightly concave. Posterolateral corner of body indistinct. Dorsal shield 582 (534–669) long and 480(412–504) wide. Dorsum without humps. Medial margin of CX4 larger than medial margin of CX3. Medial distance of CX4 smaller than width of one genital valve. In some specimens the posteromedial corner of CX4 is almost absent (Figure 60). Gonopore 111 long, genital valves without chitinous patches. Genital plates short and narrow, (slightly) bowed (Figure 59). Lengths of PI–PV: 36, 74, 46, 62, 34; PII with 4 setae on medial side. Lengths of I-leg-4-6: 107, 116, 107. Lengths of IV-leg-4-6: 155, 160, 131.

Etymology

The species is named for its purple colour.

Arrenurus (Micruracarus) separatus sp. nov.
Figures 61–64

Material Examined

Holotype

♂, Pond Dales Gorge, Hamersley Range National Park, Western Australia, Australia, 12 August 1994 (WAM).

Diagnosis

Male without cauda, pygal lobes and petiole; body posteriorly with a concavity, with a complicated structure; genital plates separated medially, not fused with gonopore.

Description

Male

Body 587 long and 495 wide. Body colour yellowish brown, legs purple. Anterior body margin convex. Cauda, pygal lobes and petiole absent (Figure 62). Dorsal furrow incomplete, passing onto posterior body part. Body posteriorly with a concavity, in which a complicated structure is visible, which is better illustrated than described (Figure 63). Posterior body margin with a small notch. Gonopore 29 long. Genital plates separated, not fused with gonopore (Figure 61). Lengths of PI–PV: 41, 110, 70, 103, 49; PII with two setae on medial side (Figure 64). Lengths of I-leg-4-6: 111, 126, 97. Lengths of IV-leg-4-6: 160, 131, 136; IV-leg-4 without a spur; third and fourth legs with numerous swimming setae.

Female

Unknown.

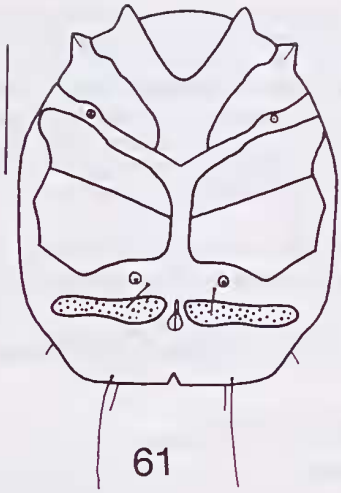
Etymology

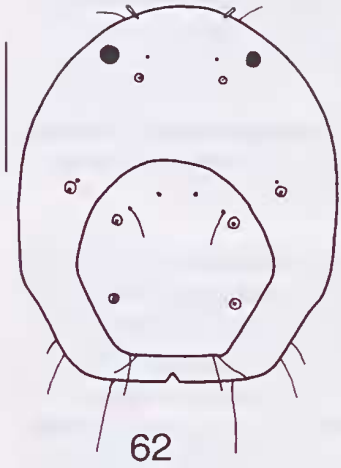
Named after its separated genital plates.

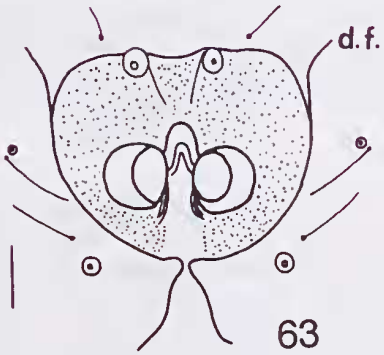
Arrenurus (Rhinophoracarus) gracilipes Piersig

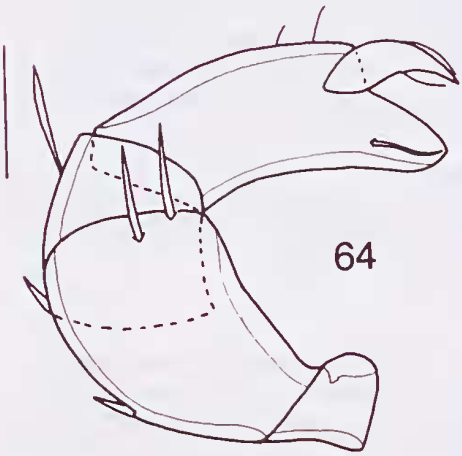
Arrhenurus gracilipes Piersig, 1906: 370.

Rhinophoracarus gracilipes Piersig: K. Viets, 1935: 2; Lundblad, 1969: 392.









Figures 61–64 *Arrenurus (Micruracarus) separatus* sp. nov., holotype ♂: 61, ventral view; 62, dorsal view; 63, posterior view; 64, palp. Scale lines, 50 µm (Figures 63–64), 200 µm (Figures 61–62). d.f. = dorsal furrow.

Material Examined

Australia: Northern Territory: 2 ♂, Lake Jabiru, Jabiru, 20 July 1994 (ZMA).

The first record of this subgenus for Australia. *A. gracilipes* is widespread, and reported from India, Sumatra and Java.

Arrenurus (Brevicaudaturus) subgen. nov.

Type species

Arrenurus lohmanni Piersig, 1898.

Diagnosis

Male

Characters of Arrenuridae. Dorsal shield present, dorsal furrow complete or passing onto lateral sides. Cauda short and wide, posteriorly with a median cleft. D1 on very large humps.

Female

D1 on very large humps.

Remarks

The taxonomic position of this very distinct

group of water mites has puzzled acarologists for a long time. K. Viets (1956) placed species of this group in the subgenus *Micruracarus*, probably because the presence of a median cleft in the cauda. Later, Cook (1957) assigned this group to the subgenus *Megaluracarus*. However, species of the new subgenus are very different from all *Megaluracarus* species. All members of the new subspecies have D1 on very large humps, and many species have other large humps on the dorsum or one hump between the humps of D1, which give them a very three-dimensional appearance.

The following species belong to the new subgenus (all comb. nov.): *A. lohmanni*, *A. bicornutus* Piersig, *A. laticodulus* Piersig, *A. matupitensis* Piersig, *A. quadricornutus* Piersig, *A. multicornutus* Walter, *A. toxopeusi* K. Viets, *A. tricornutus* K. Viets, *A. roobeeki* Smit (all from the Indo–Australian region and the Pacific), *A. imperator imperator* Lundblad, *A. imperator goliath* Lundblad, *A. guatemaltecus* K.O. Viets, *A. toriger* K. Viets (all from the neotropics), *A. gibbus* Koenike, *A. palpebratus* Nordenskiöld, *A. dumazeri* Motas, *A. neolaticodulus* Cook, *A. discretus* Cook (all from Africa).

Arrenurus (Brevicaudaturus) lohmanni Piersig, comb. nov.

Figures 35–40

Arrhenurus Lohmanni Piersig, 1898: 572.

Arrhenurus lohmanni Piersig: Piersig, 1903: 21.

Arrenurus lohmanni Piersig: Cook and Bright 1983: 198.

Material Examined

Australia: Western Australia: 1 ♂, 8 ♀, McKenzie Spring, Millstream-Chichester National Park, 17 August 1994 (ZMA).

Description

Male

Body 1464 long, 1176 wide and 1350 high. Two large humps on the anterior body part not fully sclerotized (Figures 36, 37). The corners of the cauda are bluntly-pointed, but are probably not fully sclerotized as well (Figure 35). Lengths of PI–PV: 45, 113, 65, 122, 55; PII with three setae on medial side. Lengths of I-leg-4-6: 194, 213, 310. Lengths of IV-leg-4-6: 320, 291, 252.

Female

Body 2040 (1848–2148) long, 1608 (1464–1680) wide and 1824 (1632–1944) high. Body colour yellow. Anterior part of body with three large, conical humps, D1 on the two lateral humps, medial hump without glandularia (Figure 39); the humps of D1 narrowed dorsally (Figure 40), the medial hump of equal wide. Dorsal furrow complete, dorsal shield pear-shaped. Dorsal shield 1152 long, with one pair of large humps, on which D4 are situated. Posterior body margin indented. L4 on a small hump. Coxal field small. CX4 almost without medial margin. Gonopore 142 long. Genital plates long and narrow, strongly bowed, extending onto lateral side of body, halfway lateral end of genital plates widened (Figure 38). E4 situated posteriorly of gonopore. Lengths of PI–PV: 55, 136, 79, 140, 60. PII with four setae on medial side, palp as in male. Lengths of I-leg-4-6: 242, 252, 378; Lengths of IV-leg-4-6: 369, 340, 272.

Remarks

A little known but widespread species, reported from the Bismarck Archipelago, Buru and the Palau Islands. This record is the first for Australia. The female has not been previously described.

The male resembles in most aspects the descriptions of Piersig (1903) and Cook and Bright (1983). The specimen of Cook and Bright is smaller (body length 1200) and the genital plate is wider than my own specimen and that of Piersig. The female has three large humps on the anterior body part, while the male has only two. Cook and Bright suspected that *A. matupitensis* Piersig was the female of *A. lohmanni* (a female without humps on the dorsal shield). Now that male and female have been found together, this assumption must be rejected. The female of *A. lohmanni* is close to *A. tricornutus* K. Viets, which has a very similar body shape and configuration of the large humps. *A. tricornutus* is smaller, the small humps near the eyes are more pointed, the anterior body margin is more concave and the genital plate is over its whole length of equal width.

Arrenurus (Brevicaudaturus) tricornutus K. Viets

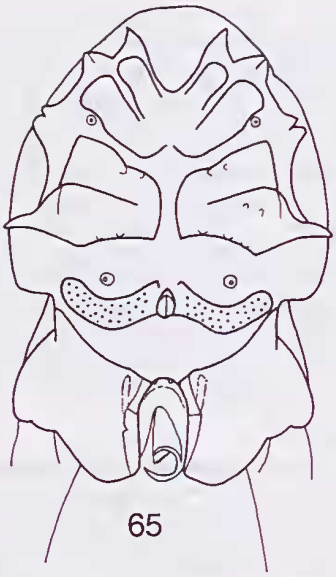
Arrenurus tricornutus K. Viets, 1955: 25; K.O. Viets, 1975: 93; Smit, 1992: 106.

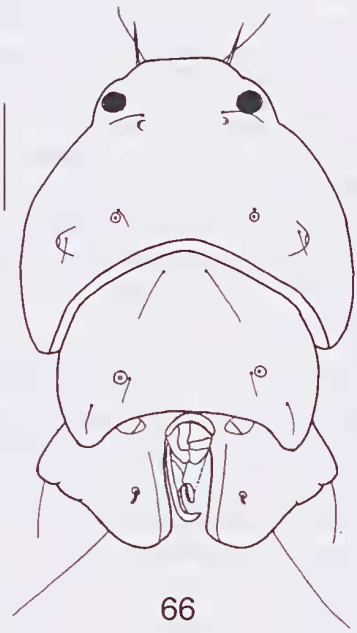
Material Examined

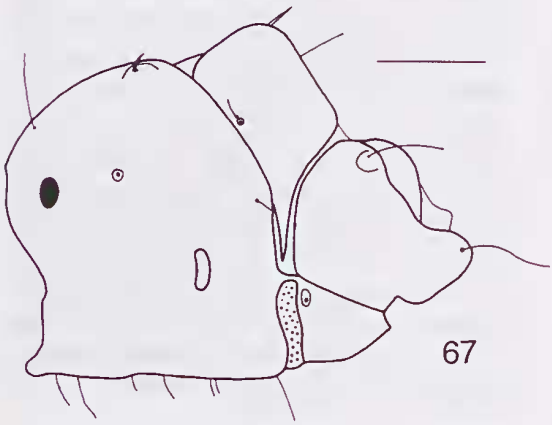
Australia: Northern Territory: 4 ♂, 4 ♀, Small Billabong, Gunlon, Kakadu National Park, 25 July 1994 (ZMA).

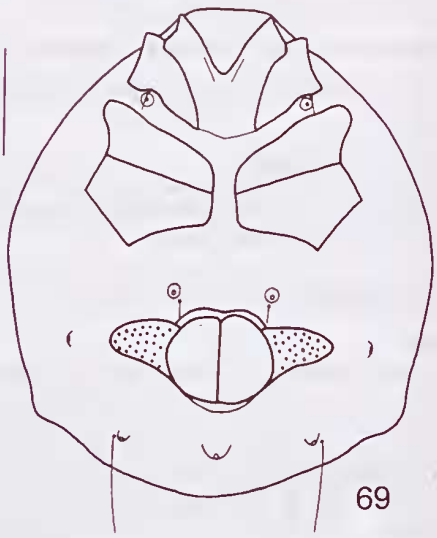
Remarks

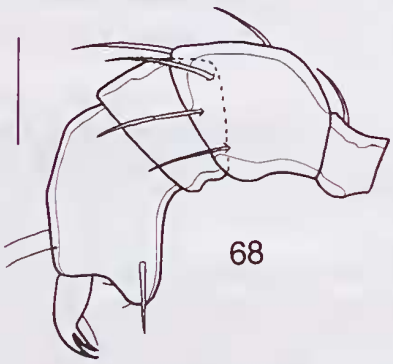
So far, this species has only been reported from Queensland (K. Viets 1955; Smit 1992). Females from this study vary in body length from 1548–1764 and in body width from 1248–1392, males vary in body length from 1248–1399 and in body width from 1032–1128. The males are thus smaller than specimens from eastern Australia.











Figures 65–69 *Arrenurus (Dividuracarus) tripartitus* sp. nov., holotype ♂ (unless stated otherwise): 65, ventral view; 66, dorsal view; 67, lateral view; 68, palp; 69, ventral view, paratype ♀. Scale lines, 50 µm (Figure 68), 200 µm (Figures 65–67, 69).

Arrenurus (Dividuracarus) subgen. nov.

Type species

Arrenurus (Dividuracarus) tripartitus sp. nov.

Diagnosis

Male

Characters of Arrenuridae. Body divided in three parts with complete suture lines, middle part analogous with dorsal shield. Posterior part with a large median cleft. D1 and D2 on anterior body part, close to each other, D3 and D4 on posterior body part. No petiole present, but instead a protrusible, hyaline tube-like structure.

Female

Without subgeneric characters. Genital plates reversed bowed.

Remarks

The very unusual division of the body together with the tube-like structure is not found in any of the Arrenuridae.

Arrenurus (Dividuracarus) tripartitus sp. nov.
Figures 65–69

Arrenurus spec. B Smit, 1992: 110.

Material Examined

Holotype

♂, Jones River, east of Roeburne, Western Australia, Australia, 17 August 1994 (WAM).

Paratypes

Australia: Queensland: 1 ♀, Cloncurry River, Cloncurry, Queensland, 14 August 1989 (ZMA). Western Australia: 1 ♀, Fortescue Falls (pool), Hamersley Range National Park, 11 August 1994 (ZMA); 1 ♀, Pond Kalamina Gorge, near falls, Hamersley Range National Park, 13 August 1994 (WAM); 1 ♂, 2 ♀, 1 nymph, Palm Pool, Millstream-Chichester National Park, 15 August 1994 (ZMA); 1 ♂, 4 ♀, Small pond near Crossing Pool, Millstream-Chichester National Park, 16 August 1994 (WAM); 1 ♂, 2 ♀, Pond Snake Creek, Millstream-Chichester National Park, 17 August 1994 (NTM); 1 ♀, Ashburton River at crossing with North West Coastal Highway, 18 August 1994 (ZMA).

Diagnosis

As for subgenus. Body colour orange to yellow. Ventral body part of male extending well beyond dorsal body part. Female with distinct posterolateral corners of the body.

Description

Male

Body 922 (912–931) long (without tube-like structure) and 621 (592–640) wide. Body colour orange to yellow. Body divided in three parts, with complete suture lines (Figure 67). Posterior body part with a large median cleft. Suture lines between CX1 and CX2 and between CX3 and CX4 incomplete. Gonopore 48 long. Genital plates bowed, not extending to lateral body margin (Figure 65). No normal petiole present, but a complicated, hyaline tube-like structure with the anterior part rounded and sclerotized; hyaline tube protrusible, open posteriorly and laterally, with serrated lateral margins (Figure 66). D2 shifted to anterior body part, D3 and D4 on middle part, D3 shifted laterally. Lengths of PI–PV: 31, 79, 48, 84, 38; PII with 2 setae on medial side (Figure 68). Lengths of I-leg-4-6: 116, 116, 97; lengths of IV-leg-4-6: 175, 155, 163. IV-leg-4 without a spur; second, third and fourth legs with numerous swimming setae.

Female

The female has been referred to by Smit (1992) as *Arrenurus* spec B. Body 892 (854–946) long and 752 (698–800) wide. Body with distinct posterolateral corners. Dorsal furrow incomplete, dorsum without humps. Medial margin of CX4 larger than medial margin of CX3. Medial distance of CX4 less than width of one genital valve. Gonopore 155 long; genital valves without chitinous patches. Genital plates short, reversed bowed (Figure 69). Posterior body part truncated. Lengths of PI–PV: 34, 86, 58, 82, 46; PII with three setae on medial side. Lengths of I-leg-4-6: 116, 116, 92. Lengths of IV-leg-4-6: 184, 194, 155. Second, third and fourth legs with numerous swimming setae

Remarks

For discussion see *A. gereckei* sp. nov.

Etymology

The species is named for the division of the body in three parts.

Arrenurus (Dividuracarus) gereckei sp. nov.
Figures 70–73

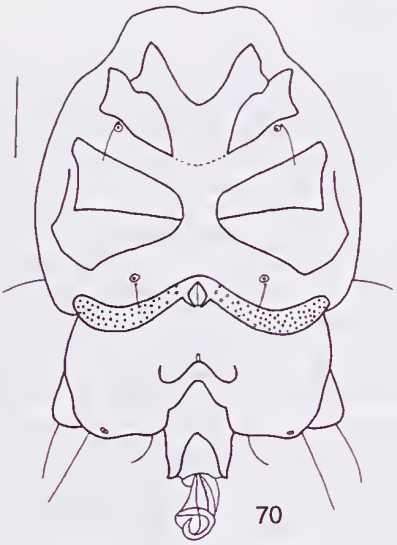
Material Examined

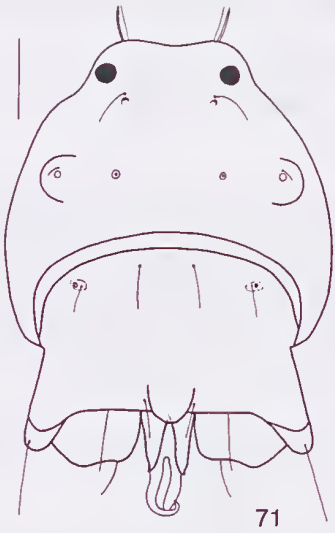
Holotype

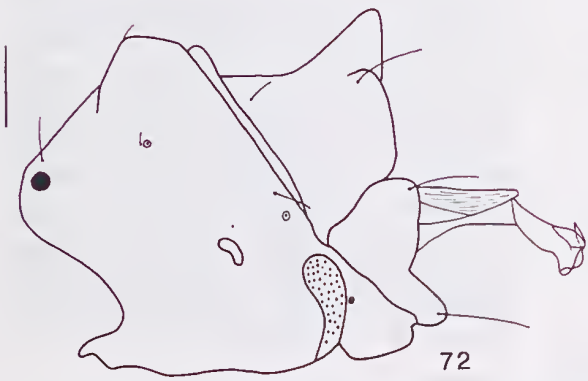
♂, Lake Jabiru, Jabiru, Northern Territory, Australia, 20 July 1994 (NTM).

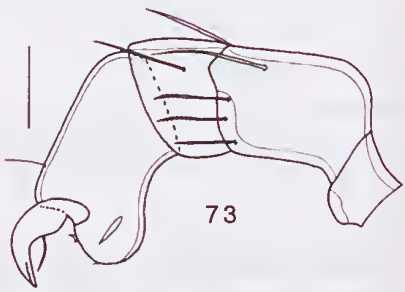
Paratype

Australia: Northern Territory: 1 ♂ (not fully sclerotized), same data as holotype (ZMA).









Figures 70–73 *Arrenurus (Dividuracarus) gereckei* sp. nov., holotype ♂: 70, ventral view; 71, dorsal view; 72, lateral view; 73, palp. Scale lines, 50 µm (Figure 73), 200 µm (Figures 70–72).

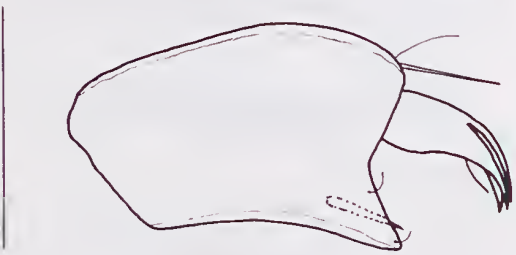


Figure 74 *Arrenurus (Megaluracarus) thienemanni* K.O. Viets, ♂, outer side PIV and PV. Scale line, 50 µm.

Diagnosis

As for subgenus. Body colour brownish-green; dorsal posterior body part with a large, conical hump. Ventral posterior body part extending little beyond dorsal posterior body part.

Description

Male

Body 1028 long (without tube-like structure) and 815 wide. Body colour brownish-green. Anterior margin of body slightly concave. Body divided in three parts, with complete suture lines (Figure 72). Ventral posterior body part with a large median cleft, dorsal posterior body part with a large,

conical hump. D1 on a hump, D2 lateral of this hump on posterior dorsal body part. Medial margin of CX3 longer than medial margin of CX4; CX4 without posteromedial corner. Gonopore 58 long. Genital plates long and bowed, extending onto lateral sides of body (Figure 70). Petiole a protrusible hyaline, tube-like structure, open posteriorly, at basis with a scissor-like sclerotization (Figure 71). Lengths of PI–PV: 36, 98, 72, 110, 53. PII with 4 setae on medial side; PIV with a rounded anteroventral corner (Figure 73). Lengths of I-leg-4-6: 165, 150, 136. Lengths of IV-leg-4-6: 281, 170, 184; IV-leg-4 without a spur; second, third and fourth legs with numerous swimming setae.

Female

Unknown.

Remarks

A. gereckei can be separated from the *A. tripartitus* by its body colour, the large, conical hump on the posterior dorsal body part and the shape of the body (ventral posterior body part less extending beyond dorsal posterior body part).

Etymology

The species is named after Dr R. Gerecke.

ACKNOWLEDGEMENTS

I am indebted to Dr M.S. Harvey for his help with the preparations for this trip and for his comments on the manuscript, to the Department of Conservation and Land Management (Perth), the Australian National Parks and Wildlife Service (Darwin) and the Conservation Commission of the Northern Territory (Palmerston) for their permission to collect water mites in the national parks of Western Australia and Northern Territory, to G.M. van der Pal for her assistance with the fieldwork and to Dr M. Grasshoff (SMF) for the loan of type material of *A. thienemanni*.

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* In Smit (1992) I supposed that the year of publication should be 1948, as the *Arkiv för Zoologi* 40A (2) has been published in that year. However, the separatum is dated 1947, and has apparently been published earlier.

Key to the Australian *Arrenurus*

Key to the subgenera (males only)

1. With a petiole or protrusible, hyaline tube-like struture, usually with pygal lobes; if pygal lobes are absent with a distinct petiole extending well beyond posterior margin of body 2

   Without pygal lobes or without petiole extending beyond posterior body end 4

2. No petiole present but instead a protrusible, hyaline tube-like structure (Figure 66), body divided in three parts (Figure 67) ..... *Dividuracarus* subgen. nov.

   Petiole present, body not divided in three parts 3

3. Petiole with a large membranous extension, pygal lobes poorly developed (K. Viets 1935, figure 115a) ..... *Rhinophoracarus* (Only one species known from Australia, i.e. *Arrenurus gracilipes* Piersig)

   Petiole without membranous extension, if pygal lobes are reduced, petiole is large and extending well beyond posterior end of body ..... *Arrenurus*

4. Cauda long (more than 1/2 of body length), narrower than body and usually well set off from body ..... *Megaluracarus*

   Cauda short 5

5. Cauda not set off from body, without notch, petiole absent ..... *Truncaturus*

   Cauda well set off from body 6

6. Cauda short and wide, posteriorly with a median cleft, D1 on very large humps ..... *Brevicaudaturus* subgen. nov.

   Cauda often with a notch posteriorly, small petiole often present but not extending beyond posterior body margin, D1 not on large humps ..... *Micruracarus*

Key to the males of *Arrenurus* s.s.

1. Petiole with bifurcated setae (Figure 21) ..... *A. mantonensis* sp. nov.

   Petiole without bifurcated setae 2

2. Petiole with ligulate process 3

   Petiole without ligulate process 5

3. Ligulate process short, not extending to posterior margin of petiole (Lundblad 1947, figure 45A), body colour reddish-brown ..... *A. australicus* Lundblad

   Ligulate process long, extending to posterior margin of petiole, body colour blue to green 4

4. Ligulate process anvil-shaped (Figure 10) ..... *A. harveyi* sp. nov.

   Ligulate process spoon-shaped (K. Viets 1935, figure 119a) ..... *A. pseudoaffinis* Piersig

5. Petiole sword-like (Figure 3) *A. ensifer* sp. nov.

   Petiole wider, not sword-like 6

6. Pygal lobes very small, not extending beyond posterior body margin (K. Viets 1935, figure 118) ..... *A. rouxi* Walter

   Pygal lobes well developed, extending beyond posterior body margin 7

7. Petiole wider than long (in dorsal view) (Figure 16) ..... *A. liliaceus* sp. nov.

   Petiole narrower than long 8

8. Petiole truncated, contracted in the middle (Cook 1986, figure 1628) ..... *A. balladoniensis* Halík

   Petiole rounded posteriorly, not contracted in the middle, sometimes with a small notch posteriorly (Cook 1986, figure 1632) ..... *A. fissipetiolatus* Lundblad

Key to the males of *Arrenurus (Megaluracarus)*

1. Cauda posteriorly with a rudimentary petiole 2

   Rudimentary petiole absent 8

2. Cauda as wide as long 3
   Cauda distinctly longer than wide 4
3. Cauda posteriorly with a large, hyaline area (K.O. Viets 1978, figures 33, 34) ..... *A. victorianus* K.O. Viets
   Cauda without hyaline area (Cook 1986, figure 1649) ..... *A. cheetus* Cook
4. Cauda with triangular posterolateral projections (Cook 1986, figure 1651) ..... *A. otodus* Cook
   Cauda without triangular posterolateral projections 5
5. Posterior margin of cauda with a medial projection (Cook 1986, figure 1639) ..... *A. margatellus* Cook
   Posterior margin of cauda without a projection 6
6. Body colour blue, rudimentary petiole dagger-like (Figure 26) ..... *A. caeruleus* sp. nov.
   Body colour yellow or orange 7
7. Two closely situated rudimentary petioles present, these peg-like (Figure 45) ..... *A. vanderpalae* Smit
   Two well separated rudimentary petioles present, these rounded (Figure 31) ..... *A. gilvus* sp. nov.
8. Dorsal furrow incomplete (Figure 41) ..... *A. thienemanni* K.O. Viets
   Dorsal furrow complete 9
9. Cauda short, almost as wide as long (Walter 1929, figure 32) ..... *A. harpagopalpus* Walter
   Cauda longer than wide 10
10. Posterior margin of cauda triangular shaped (K.O. Viets 1984, figure 51) ..... *A. rostratus degeneratus* K.O. Viets
    Posterior margin of cauda rounded (Cook 1967, figure 835) ..... *A. rostratus* Daday

Key to the males of *Arrenurus (Brevicaudaturus)* subgen. nov.

1. Cauda posteriorly with large hump (Smit 1992, figure 59) ..... *A. roobeeki* Smit
   Cauda without large hump 2
2. Anterior body part with three large humps, posterior margin of dorsal shield medially convex (Smit 1992, figure 55) ..... *A. tricornutus* K. Viets
   Anterior body part with two large humps, posterior margin of dorsal shield medially straight (Figure 36) ..... *A. lohmanni* Piersig

Key to the males of *Arrenurus (Micruracarus)*

1. Dorsal shield covering entire dorsum (Smith and Harvey 1989, figure 1) ..... *A. kitchingi* Smith and Harvey
   Dorsal shield smaller than dorsum 2
2. Petiole absent, body posteriorly with a concavity, genital plates separated, not fused with gonopore (Figure 61) ..... *A. separatus* sp. nov.
   Petiole present 3
3. Petiole tong-shaped 4
   Petiole not tong-shaped 5
4. Petiole connected with cauda by a hyaline area, petiole open posteriorly (Lundblad 1947, figure 48A) ..... *A. forpicatoides* Lundblad
   Petiole separated from cauda, petiole almost closed posteriorly (Figure 48) ..... *A. anbangbang* sp. nov.
5. Petiole chisel-shaped (Figure 52) ..... *A. jabiruensis* sp. nov.
   Petiole dagger-like (Figure 57) ..... *A. purpureus* sp. nov.

Key to the males of *Arrenurus (Truncaturus)*

1. Posterior body margin with a notch (Cook 1986, figure 1656) ..... *A. haswelli* Cook
   Posterior body margin without notch 2
2. Body elongated (Lundblad 1947, figure 49A) ..... *A. tasmanicus* Lundblad
   Body short (Lundblad 1947, figure 50A) ..... *A. novaehollandiae* Lundblad

Key to the males of *Arrenurus (Dividuracarus)* subgen. nov.

1. Body colour orange-yellow, ventral body part extending well beyond dorsum, D1 on small humps (Figure 66) ..... *A. tripartitus* sp. nov.
   Body colour brownish-green, ventral body part extending a little beyond dorsum, D1 on large humps (Figure 71) ..... *A. gereckei* sp. nov.

Key to the females (all subgenera)

1. Genital valves with chitinized patches 2
   Genital valves without chitinized patches 13
2. Chitinized patches small, consisting of only a small strip at anterior and posterior part of genital valve 3
   Chitinized patches large 6

3. Large species (> 1800 µm), dorsal shield slender (Figure 2) ..... *A. balladoniensis* Halík

   Smaller species (1000–1500 µm) 4

4. Dorsal shield covering entire dorsum, genital field close to coxal field (Cook 1986, figure 1654) ..... *A. haswelli* Cook

   Dorsal field distinctly smaller than dorsum ... 5

5. Genital plate fused with genital valve over whole lateral margin of genital valve, larger species (> 1400 µm) (Figure 6) ..... *A. ensifer* sp. nov.

   Genital plate fused only over a small posterior part of genital valve (Walter 1929, figure 39), smaller species (1000–1200 µm) ..... *A. rouxi* Walter

6. With large posterolateral corners of body 7

   Posterolateral corners of body small or absent 9

7. Anterior and posterior chitinized patches of genital valve small, connected by a small strip of pigmentation (Figure 14) ..... *A. harveyi* sp. nov.

   Chitinized patches large 8

8. Anterior and posterior patches of genital valve separated (Figure 19) ..... *A. liliaceus* sp. nov.

   Anterior and posterior patches of genital valve fused (Walter 1928, figure 42) ..... *A. pseudoaffinis* Piersig

9. Genital plates short (< 2 times as large as wide) (Lundblad 1947, figure 45E) ..... *A. australicus* Lundblad

   Genital plates longer (> times as large as wide) 10

10. Genital plates wing-shaped, lateral part directed anteriorly (Viet 1935, figure 115b) ... *A. gracilipes* Piersig

    Genital plates not wing-shaped 11

11. Posterior body part truncated, posterior body margin straight (Figure 55) ..... *A. jabiruensis* sp. nov.

    Posterior body part not truncated, posterior body margin rounded 12

12. PIV with a large, pronounced anteroventral corner of PIV (Figure 49), genital plates long (> 4 times as long as wide) (Figure 50) ..... *A. anbangbang* sp. nov.

    PIV without large, pronounced anteroventral corner, genital plates shorter (< 4 times as long as wide) (Lundblad 1947, figure 48F) .... *A. forpicatoides* Lundblad

13. PII without a patch of setae 14

    PII with a patch of setae 25

14. Dorsal shield covering entire dorsum (Smith and Harvey 1989, figure 2, 3) ..... *A. kitchingi* Smith and Harvey

    Dorsal shield smaller than dorsum 15

15. Genital plates long (> 3 times as long as wide) 16

    Genital plates short (< 3 times as long as wide) 19

16. PIV very slender, anterior margin of PIV very short (Figure 23), anterior body part dorsally without large humps ..... *A. mantonensis* sp. nov.

    PIV of normal shape, anterior body part dorsally with large humps 17

17. Anterior body part dorsally with two large (bifid) humps (Smit 1992, figure 63) ..... *A. roobeeki* Smit

    Anterior body part dorsally with three large humps 18

18. Large species (> 1800 µm), genital plates widened in the middle (Figure 38) ..... *A. lohmanni* Piersig

    Smaller species (< 1800 µm), genital plates of equal width over whole length (K. Viets 1955, fig. 31) ..... *A. tricornutus* K. Viets

19. Genital plates reversed bowed (Figure 69) ..... *A. tripartitus* sp. nov.

    Genital plates different 20

20. Genital plates close to coxal field 21

    Genital plates more or less halfway coxal field and posterior body margin 22

21. Large species (> 1500 µm), genital plates not narrowed laterally (Cook 1986, figure 1637) . ..... *A. fissipetiolatus* Lundblad

    Small species (< 900 µm), genital plates narrowed laterally (Lundblad 1947, figure 49E) ..... *A. tasmanicus* Lundblad

22. Dorsum with a pointed projection (rostrum) 23

    Dorsum without pointed projection (rostrum) 24

23. Body with distinct posterolateral corners, posterior part of body truncated (K.O. Viets 1984, figure 52) ..... *A. rostratus degeneratus* K.O. Viets

    Body without posterolateral corners, posterior body margin rounded (K. Viets 1927, figure 3) ..... *A.rostratus* Daday

24. Genital plates broad (wider than length of genital valve) (Lundblad 1947, figure 50E) .... *A. novaehollandiae* Lundblad

Genital plates narrow (about half the length of genital valve) (Figure 60) .... *A. purpureus* sp. nov.

25. Posterior margin of genital plates directing laterally 26

    Posterior margin of genital plates sloping posteriorly 27

26. PIV stocky, posterior margin of genital plates with a straight posterior margin (Walter 1929, figure 33, 34) ... *A. harpagopalpus* Walter

    PIV not stocky and not tapering (Cook 1986, figure 1643), posterior margin of genital plates rounded (Cook 1986, figure 1638) .... *A. margatellus* Cook

27. Body colour blue 28

    Body colour brownish yellow-orange 29

28. Dorsal shield relatively small, ratio body length/length of dorsal shield 1.58–1.70 .... *A. caeruleus* sp. nov.

    Dorsal shield relatively large, ratio body length/length of dorsal shield 1.39–1.48 .... *A. thienemanni* K.O. Viets

29. Body length > 1000 µm, genital plates laterally angular (Figure 46) ..... *A. vanderpalae* Smit

    Body length < 1000 µm, genital plates laterally rounded (Figure 34) ..... *A. gilvus* sp. nov.

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